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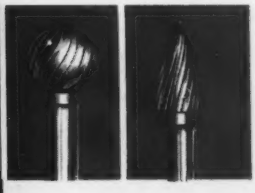
BURS

fast cutting
long life



An extended range of Wimet Burs designed to give best performance when used with modern high-speed equipment. Eight styles in a large range of sizes available.

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Wimet Division, Torrington Avenue, Coventry
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"Wimet" is the registered trade mark of Hard Metal Tools Ltd, a Wickman associated company.

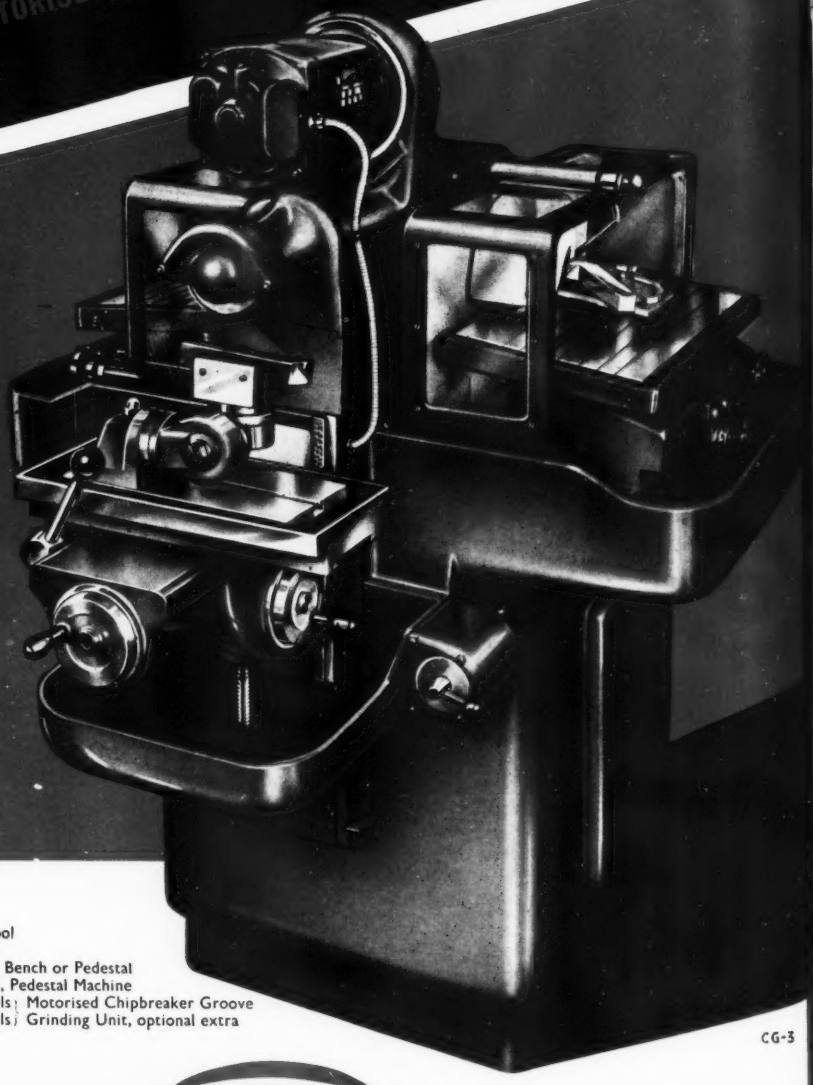
585

A

ABWOOD 'CONCENTRE' CARBIDE TOOL GRINDER

Model CG2A

WITH MOTORISED CHIP-BREAKER GROOVE GRINDING UNIT



- Constant centre height of table to grinding point irrespective of angle
- Adjustable taper roller bearings eliminate end float
- Perspex panelled spray guards provide perfect vision, hinged for easy access to wheel
- Uses diamond wheels to their maximum efficiency
- The Chipbreaker Groove Grinding Unit accommodates turning tools of most shapes and sizes

Our full range of Carbide Tool Grinding Machines includes:
Model CGO, 6 in. Wheels, Bench or Pedestal
Model CG1A, 8 in. Wheels, Pedestal Machine
Model CG2A, 8 in. Wheels } Motorised Chipbreaker Groove
Model CG3A, 12 in. Wheels } Grinding Unit, optional extra

CG-3

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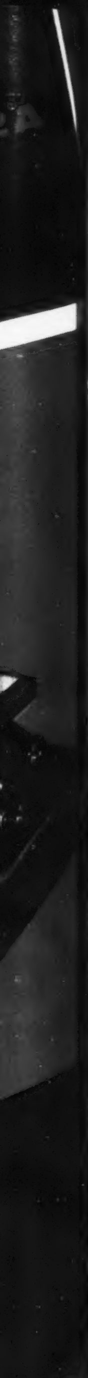

CG-3

KENT
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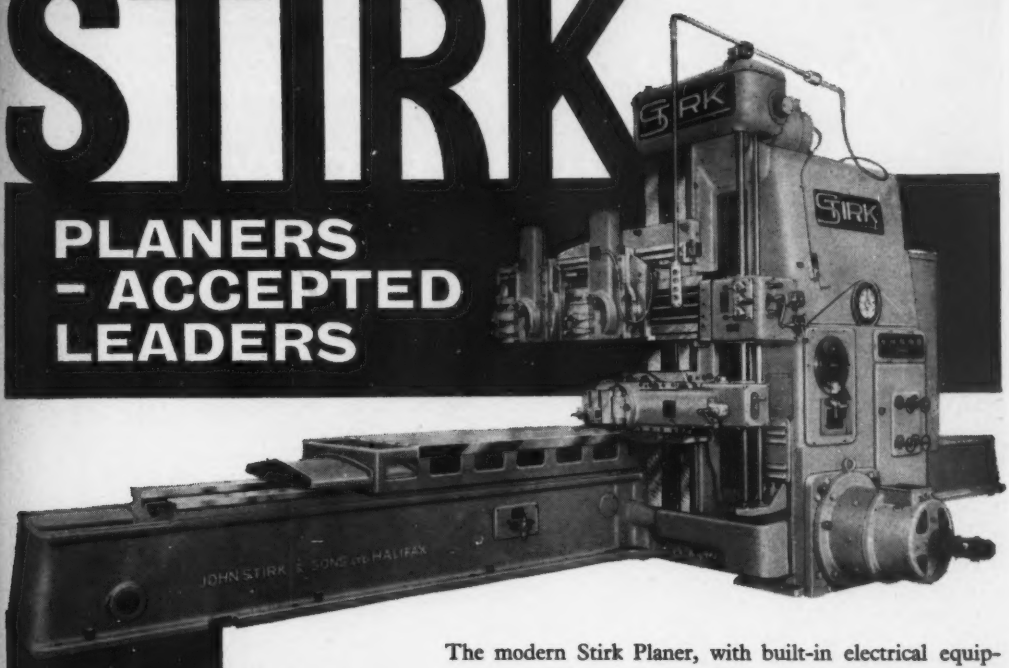
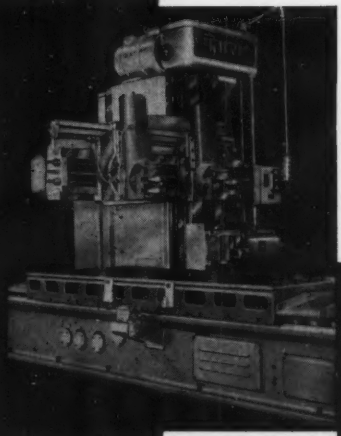
STIRK

PLANERS - ACCEPTED LEADERS





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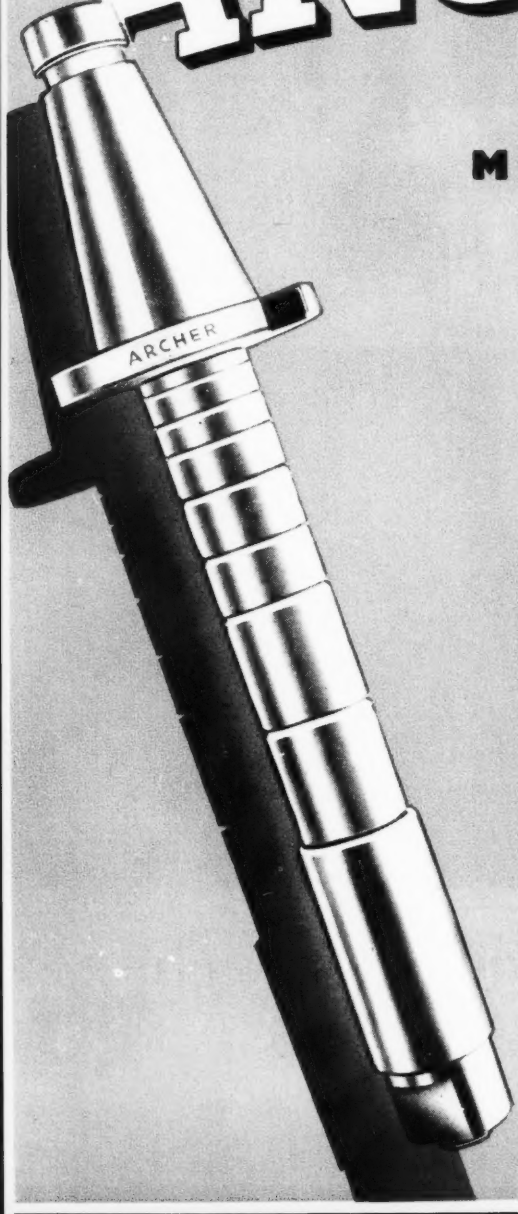

- *Extreme accuracy*
- *Maximum strength and rigidity*
- *Increased life*
- *Greater resistance to wear*
- *Made from solid forgings of nickel-chrome-molybdenum steel*
- *Accurately hardened and ground throughout, fitted with precision spacing collars and bearing collars*

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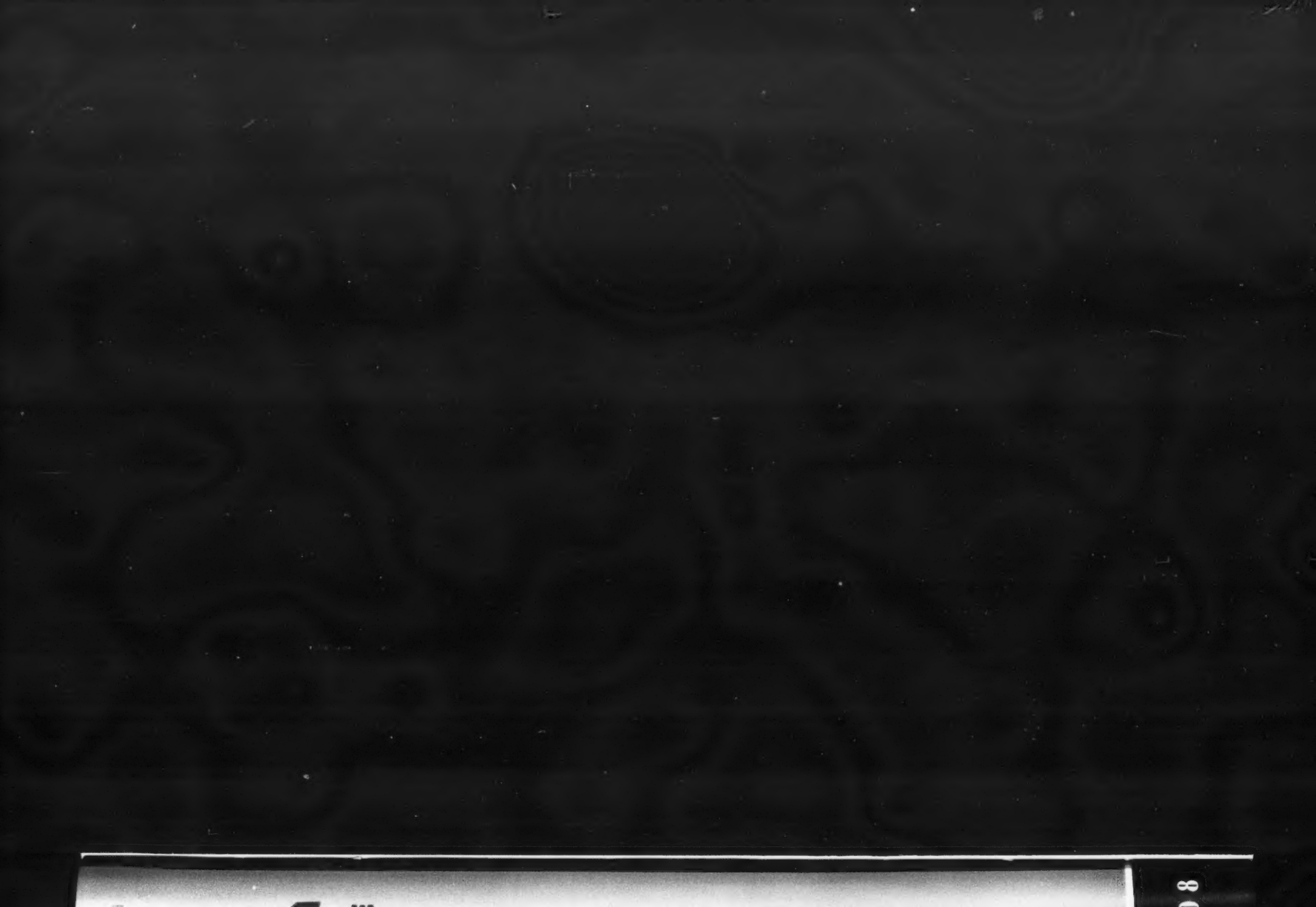

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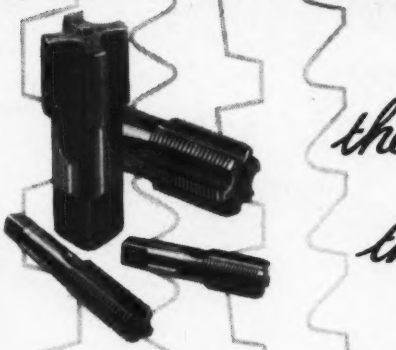

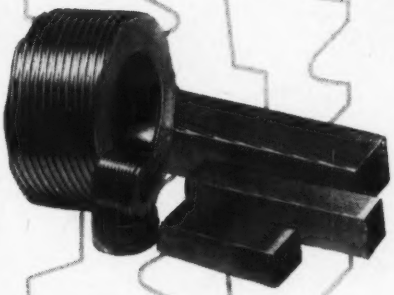

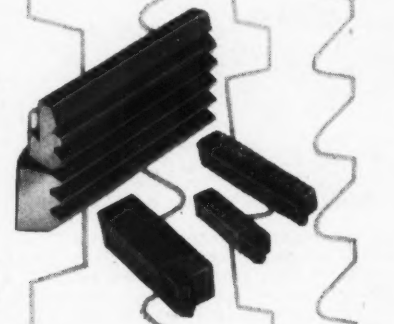

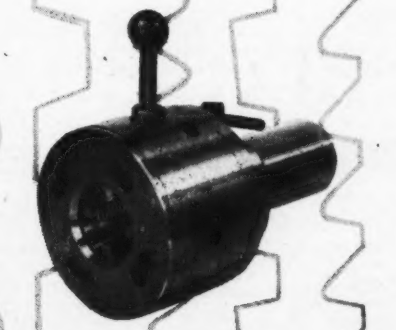

the world's finest threading equipment

MADE IN OUR OWN WORKS

A complete range of equipment for cutting or rolling standard threads and special threads such as Acme, Knuckle, Buttress; single or multi-start; right- or left-hand; short and taper threads—in all materials that can be threaded.

COVENTRY DIEHEADS. *Ten sizes, ¼" to 4½" diameter. 1500 sizes and types of Coventry Dies. The new XT Type Diehead has been specially designed for use on single-spindle automatics. Self-opening mechanism is not affected by rapid indexing of the turret. Coventry Junior Taper-threading Diehead. Five sizes ¼" to 1½". Larger sizes made to order.*

HERBERT SOLID-ADJUSTABLE DIEHEADS. *Eight sizes, ¼" to 2½" diameter. For machines having reverse to the spindle.*

HERBERT GROUND THREAD ROLLING DIES. *For Thread Rolling Heads and Machines.*

HERBERT GROUND THREAD TAPS. *Best quality high-speed steel. Stocked for all standard threads, special taps to order.*

THREAD CHASING TOOLS. *For Cri-Dan and other threading machines, capstan and turret lathes. Ardoloy-tipped or High-speed steel. Tangential, square or circular types; full or truncated forms.*

We also supply complete equipment for tool maintenance and for the measurement and inspection of screw threads.

Consult our specialists on all threading problems

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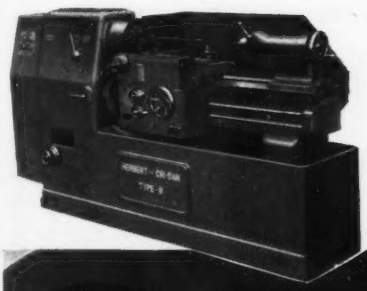
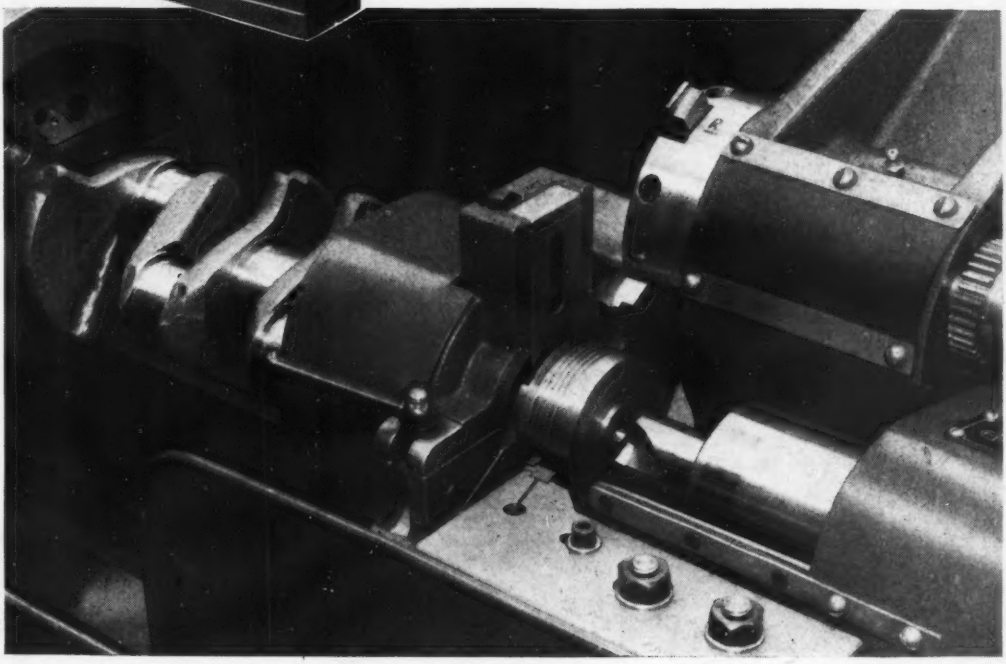
B2



Simultaneous high-speed threading, facing and forming on crankshafts



A standard Herbert/Cri-Dan B specially equipped so that simultaneously with cutting a 2⅞in. x 8 T.P.I. Whit half-depth oil return thread .620in. long, an annular groove $\frac{5}{16}$in. x $\frac{5}{16}$in. into which the thread runs is formed and a 1¼in. dia. x ¼in. boss which was previously left on the end face of the crankshaft, is partially removed.

HERBERT/CRI-DAN TYPE 'B'

Precision threads are cut in a fraction of the time taken on a thread miller or centre lathe.
Capable of cutting external or internal, parallel or taper, right or left-hand, single or multi-start threads in all forms and in any material that can be threaded.
Over 500 of these machines have been installed in customers' works since 1948.
Cut threads up to 5 T.P.I. in mild steel on 4in. external and 6in. internal diameters.

ALFRED HERBERT LTD., COVENTRY

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NOW-Really *FAST* Pressing

on the NEW 5, 10 and 15 ton

RG HIGH SPEED HYDRAULIC PRESSES

Built solely for 'D & D' by Rhodes, Gill & Co. Ltd., specialists in high pressure hydraulics. Entire mechanism enclosed within sturdy fabricated steel frame. High ram speeds plus positive power return. Working pressure and slow advance for setting easily controlled. Pressure gauge and isolating valve provided. Compactly housed ram guides cannot foul pillars of die sets. Perspex guards available providing unobstructed view of entire table.

5 ton bench and pedestal models. 10 and 15 ton models available with stroke limiting device (provides extremely accurate "inching"), T-slotted tables and automatic rotary indexing table.

	5 TON	10 TON	15 TON
STROKE	4"	8"	10"
TABLE SIZE	14" x 11½"	16" x 14"	18" x 16"

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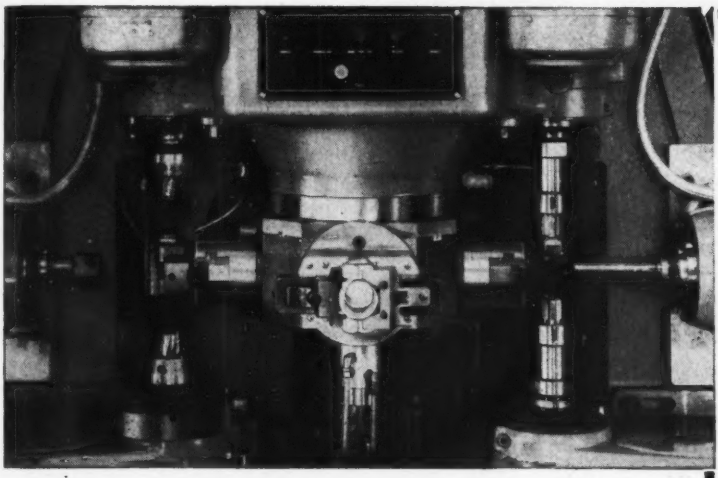

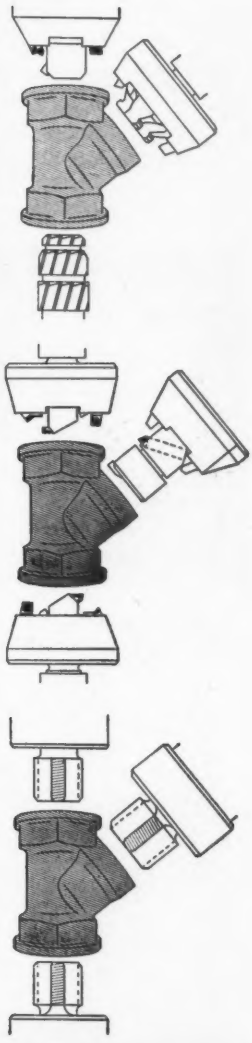

Diedesheim fully Automatic multi-unit machine

for the production of pipe fittings, valve and cock bodies

and similar components

MODEL AMI WITH 9 UNITS

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- Suitable for drilling — boring — facing — threading — sawing — milling — multi-spindle drilling & tapping, etc.
- Simultaneous machining — from three directions — at each station.
- Capacity for ⅜″ to 2″ nominal size pipe fittings
- Spindle speeds to suit all materials
- Infinitely variable feed to each unit
- Foolproof reloading during cutting cycle
- Hydraulic chucking with auto-release
- Rapid change-over to different components
- Three or four working stations

Production times for lateral valve housing illustrated:
¼″ nom. size: 7 secs. 1″ nom. size: 10 secs. 2″ nom. size: 18 secs.

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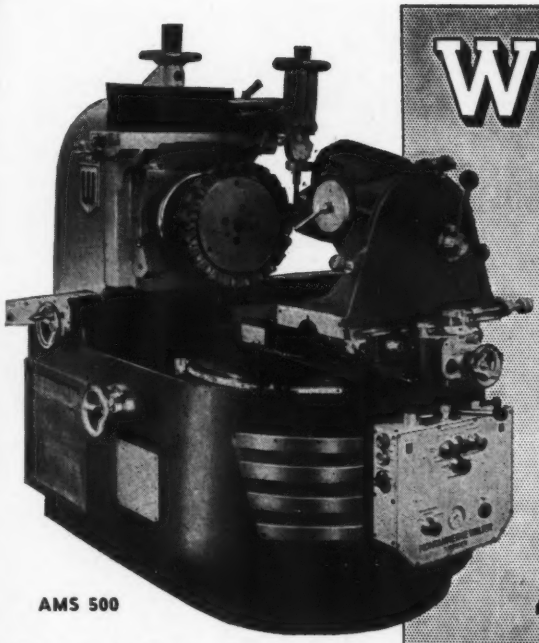
WALTER

AUTOMATIC

Cutter Head Grinders



AMS 500

★ **Fully Automatic Hydraulic Cutter Head Grinders.**

★ **Face and periphery of blades with connecting radius, ground in one continuous operation.**

★ **Automatic Grinding of staggered tooth cutters.**

★ **Suitable for carbide or high speed steel cutters.**

Model AMS 1000.
Capacity cutter diameter 4 - 40".

Model AMS 500
Capacity cutter diameter 3⅛-20"
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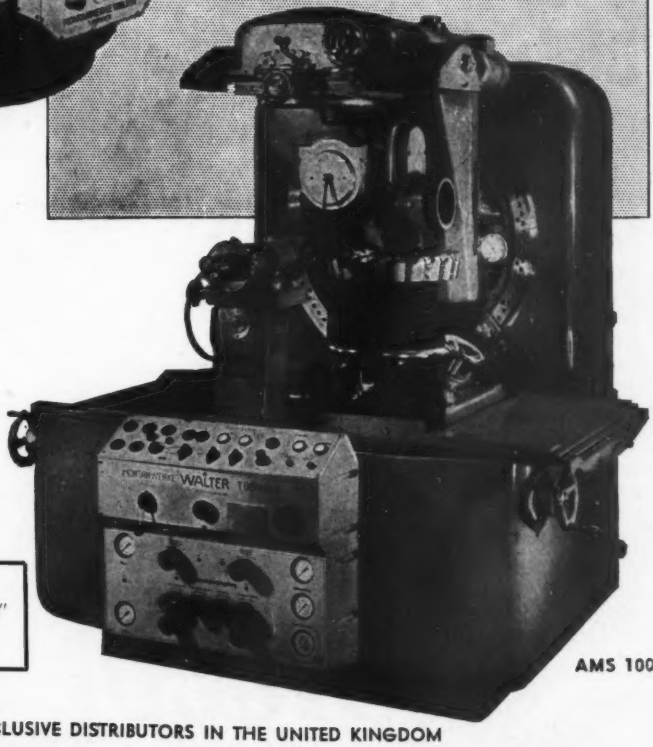

AMS 1000

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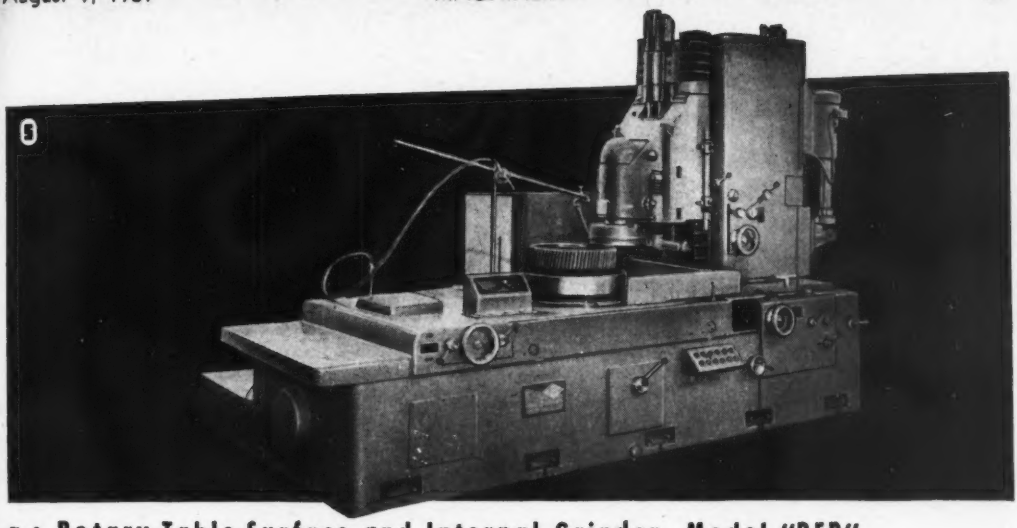

Fig. 1 **Rotary Table Surface and Internal Grinder, Model "RFB" with swivel column and 2 wheelheads (Patents home and abroad).**

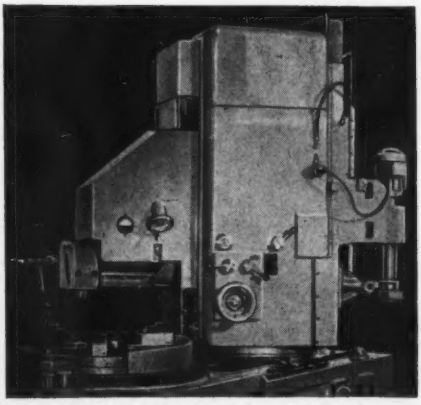

Fig. 2 Surface grinding head with periphery grinding wheel

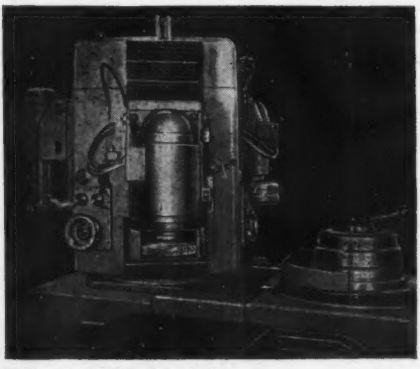

Fig. 3 Model "RFBR" with 3 wheelheads

- Several grinding operations can be carried out on a component in one mounting, which guarantees absolute concentricity and parallelity of the ground surfaces.
- Mounting and truing is only done once, thus avoiding double setting times.
- The wheelheads can be adapted for the desired grinding operations.
  Fig. 1 : Segmental head for surface grinding
  Fig. 2 : Periphery grinding wheel for surface grinding
  Fig. 3 : 3 wheelheads, Surface -, Internal - and External Grinding
- Range of Application :

  Surface grinding up to 52" diameter
  Internal grinding up to 48" diameter
  External grinding up to 48" diameter

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HANS SIELEMANN
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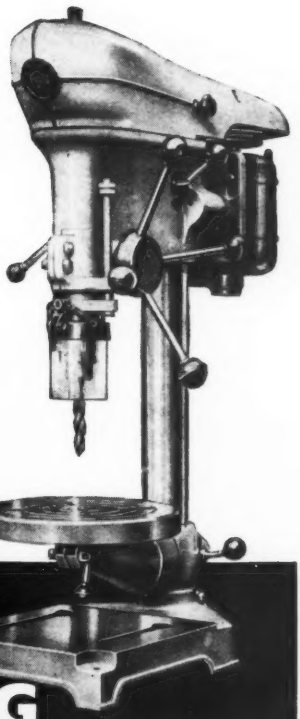
KERRY



KERRY ¾ INCH CAPACITY SUPER "8" SPEED DRILL

A production and general purpose jobbing machine, robustly constructed to ensure absolute reliability under the most arduous operating conditions. Features that have made this Super "8" so popular include a wide speed range — from 86 to 3,360 r.p.m. or 45 to 2,000 r.p.m. and adaptability for such applications as drilling, reaming, tapping, lapping, trepanning, etc. Tens of thousands are in use throughout industry today. The Super "8" is available as a bench, pedestal or line production model together with a complete selection of attachments for special application.

BENCH DRILLING MACHINES

THE KERRY "DRILLMASTER"

A ½ inch capacity production drilling machine designed for continuous operation over long periods. The "Drillmaster" can be supplied with a low, standard, or high speed range to suit customers' requirements. Each model has 4 spindle speeds ranging — in the low speed machine from 300 to 2,200 r.p.m. — the standard from 617 to 3,360 r.p.m., and the high speed machine up to 7,000 r.p.m.
Bench, pillar and line production models are available in the above speed ranges.

KERRY'S

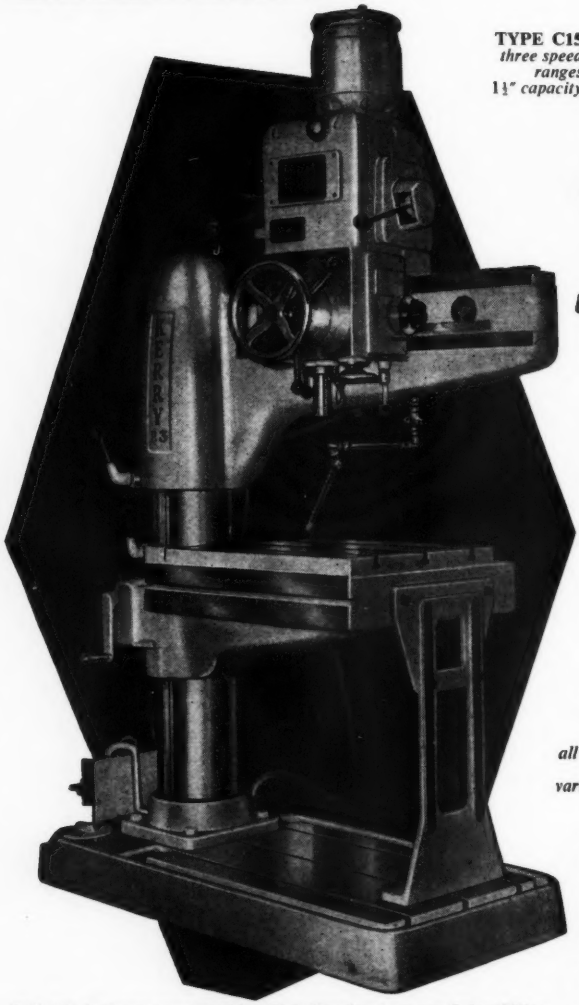
manufactured within the KERRY GROUP by
KERRY'S (Engineering) CO. LTD
GRANGE ROAD, LEYTON, LONDON, E.10

A Kerry COMPANY

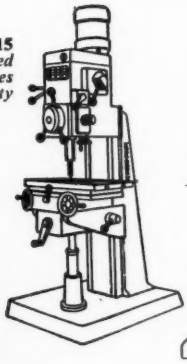
Sales Office: WARTON ROAD, STRATFORD, LONDON, E.15. Telephone: MARyland 6611

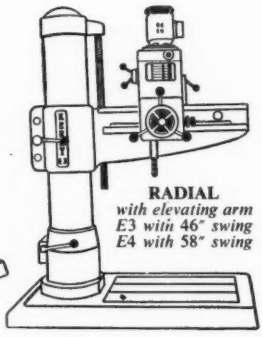
C

KERRY RANGE OF DRILLING MACHINES



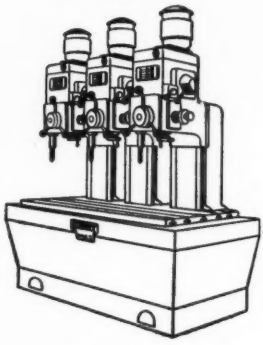
TYPE C15
three speed ranges
1¼″ capacity

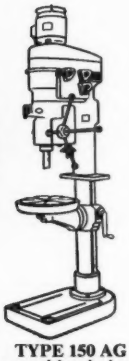




RADIAL
with elevating arm
E3 with 46″ swing
E4 with 58″ swing

MULTI-HEAD
MS 3
line production unit 1½″ capacity





TYPE 150 AG
all geared head also 150 IV infinitely variable 1½″ capacity

The Radial Drill illustrated on the left is available in 2 models. The R3 has a swing of 36″, the R4, 48″. Both models have a capacity of 1¼″ in steel and 1½″ in cast iron, 9 spindle speeds ranging from 90 to 1120 r.p.m., quick hand traverse, fine hand feed and three rates of power feed. The Kerry range of drilling machines includes bench, pillar and line production models with drilling capacities from ½″ to 1½″.

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BARNSLEY, YORKSHIRE

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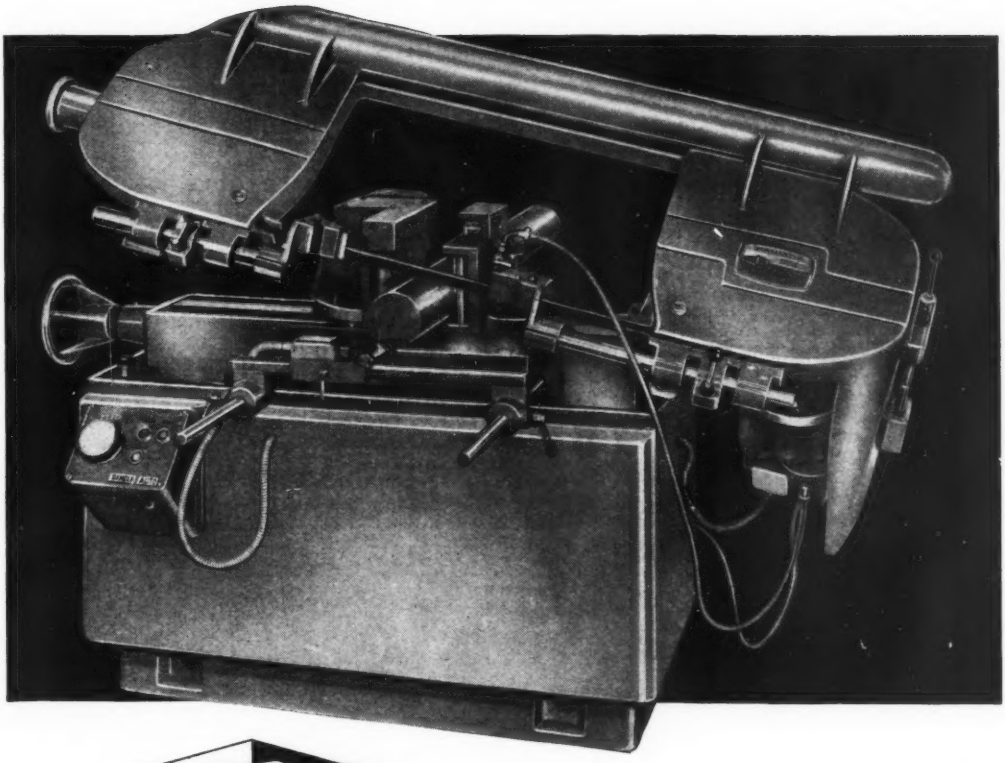

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SAWMASTER

TYPE 10B AUTOCUT

HEAVY-DUTY

BANDSAW

For higher production

Infinitely variable cutting speeds, accurate blade guidance, faster cutting times, power lifting and lowering of sawframe, simplicity of operation and of blade changing mean higher production than with any comparable saw. The completely automatic cutting cycle facilitates repetition work.

the British made Bandsaw that is in the world's top class

—and the famous SAWMASTER Power Hacksaws 6" 8" 10" or 12" capacity

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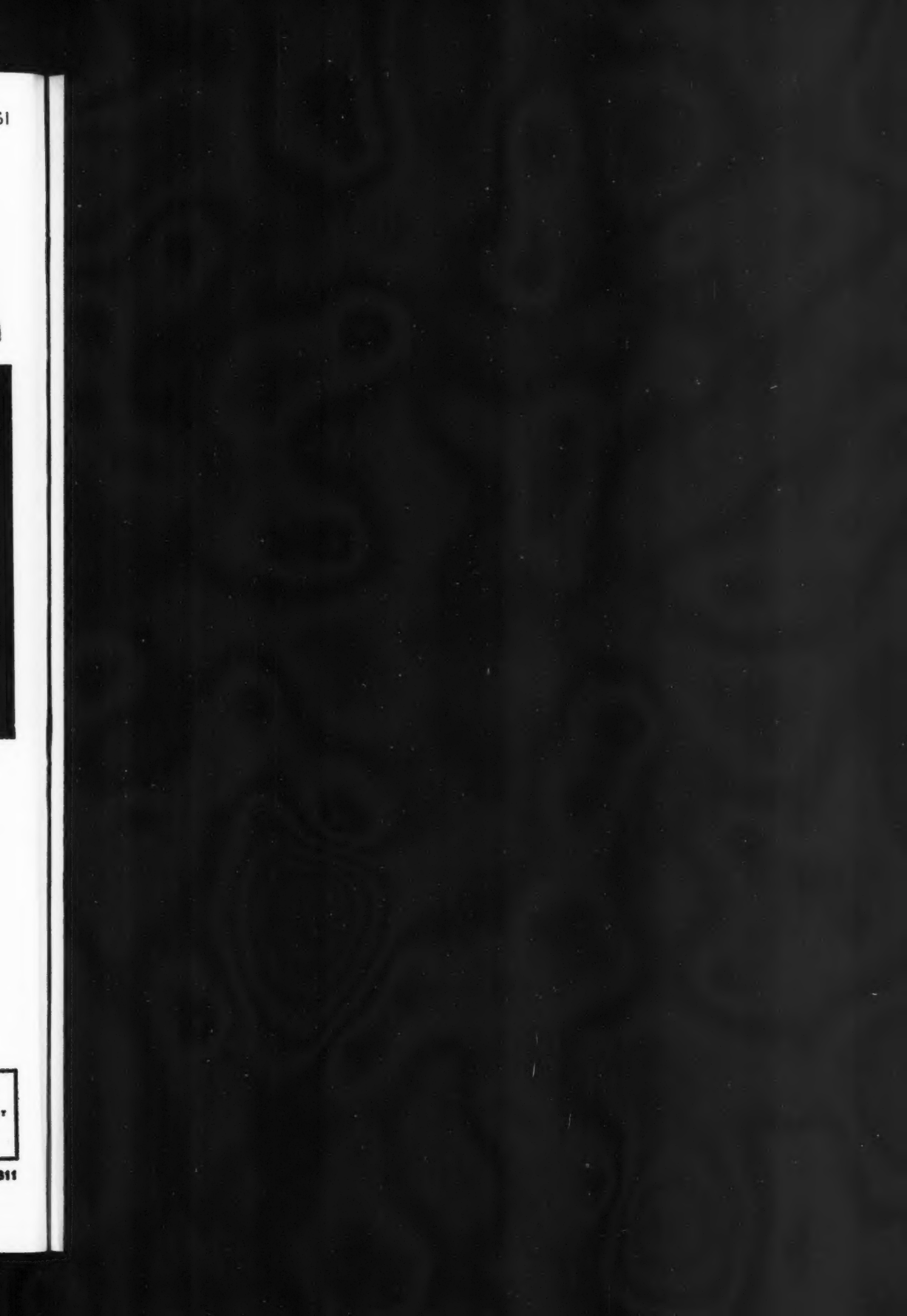

Cold Headed Bolts and Set Screws

Why look elsewhere, when all the benefits of long specialization plus the closest adherence to exacting quality standards are so conveniently available. Let ORMOND quote for all Repetition Parts—for single and multi spindle automatics up to 1¼" diameter; Brass, Steel and Light Alloy Screws in Rolled and Cut Threads, Grub screws, Nuts, Allthreads, Hexagon Bolts and Set screws turned from bar and Cold Headed Grades "A", "B" and High Tensile.

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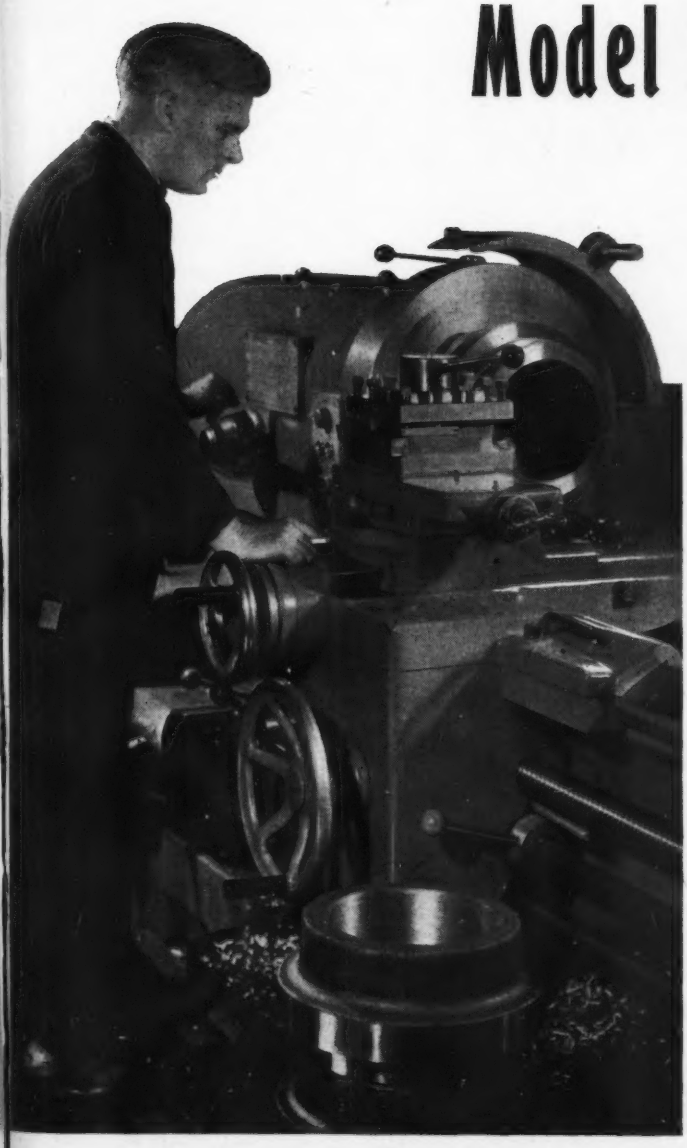

Model SR 10V

22in. and 25in. Swing

Centre Lathes

25in. Swing

Surfacing and Boring Lathe

18 Spindle Speeds in alternative ranges up to 1,000 down to 11 r.p.m.

54 Change T.E. Feed Gearbox

Comprehensive Range Optional Equipment

Centre Lathes from 17in. (430 mm) to 42in. (1065 mm) Swing.

Surfacing and Boring Lathes of 17in. (430 mm) and 25in. (635 mm) Swing

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HALIFAX • ENGLAND

MEMBER OF THE CHARLES CHURCHILL GROUP OF COMPANIES

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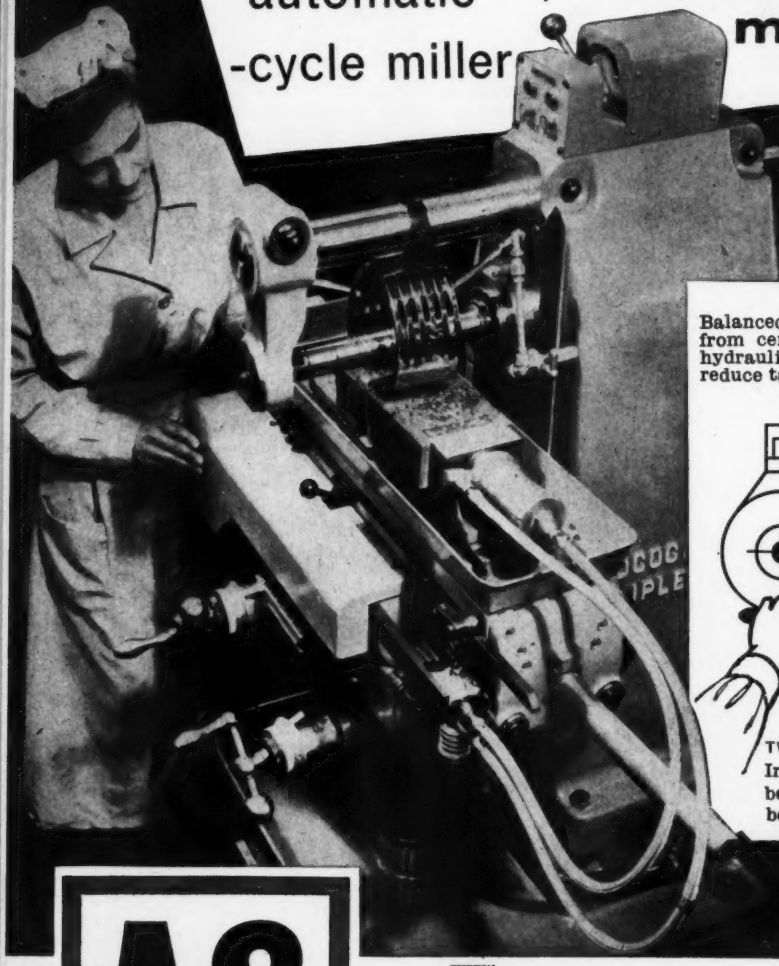
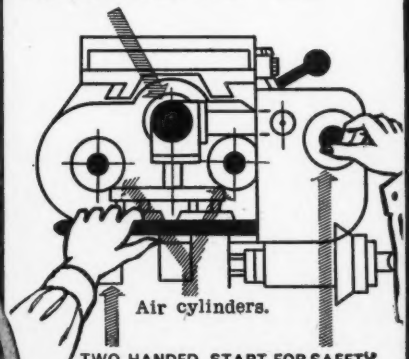
A fast automatic -cycle miller | with more weight more stamina more power



Balanced feed control from centrally placed hydraulic cylinder to reduce table-slide wear.

Emergency table return lever.



TWO HANDED START FOR SAFETY
Interlock lever must be lifted before start cycle button can be operated.

A&S

Other models in the No. 1 range

A-LSL—Hand Feed

A-G—Automatic Feed

A-J—Automatic Cycle

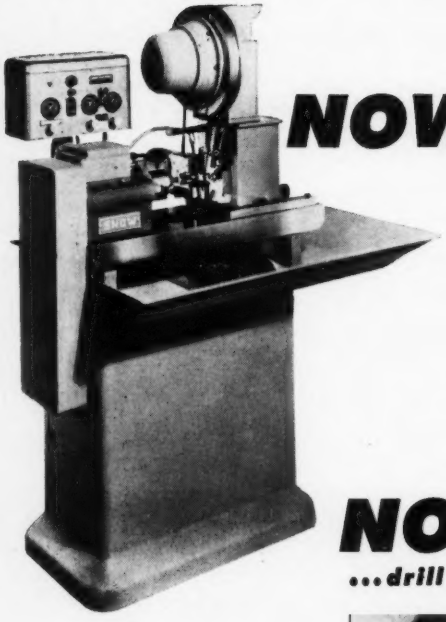
MODEL 1 HORIZONTAL MILLER

Air Hydraulic Automatic Cycle

No comparable miller has the weight and the power of the air-hydraulic A & S Model 1. 1,400 lb. weight, 2 h.p. strength and three bearings to spindle give this superb machine the speed, brawn and stamina no other air hydraulic miller can touch. By air-hydraulic table drive (powered by the shop air supply), greater cutter life, immaculate finish and faster automatic cycles are achieved. Two air cylinders exert balanced thrust on the table slides, eliminating side-thrust wear, and safeguarding the unfailing accuracy of the machine. With two-hand controls and an emergency return lever, the A & S Model 1 is also the safest of all millers. Write for illustrated brochure on A & S Model 1 Range.

Still built up to top standard - AND top value!

ADCOCK & SHIPLEY LTD P.O. Box 22, Ash Street, Leicester.
Telephone: Leicester 24154-5-6 *Grams & Cables: Adcock Leicester*



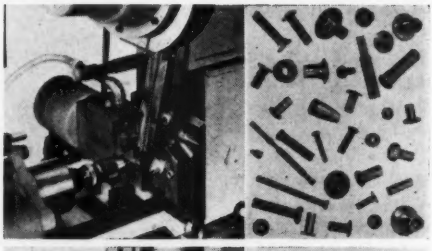
NOW AVAILABLE

for automatic drilling, tapping or threading

Hand feed or hopper feed with or without air-operated clamp

NOW

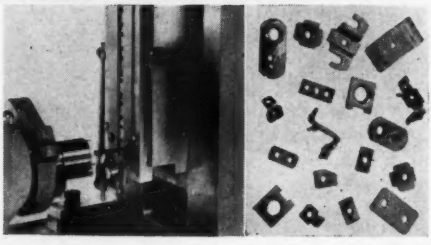
...drill rivets faster with minimum tooling costs



Drills 500 - 3,600 per hour; hopper feed; air-operated clamping. Capacity No. 74 (.0225") to 3/8" in mild steel.

SNOW

Machines and Master fixtures save pounds and days in tooling costs



Taps 4,000 per hour hand feed magazine. Capacity 10B.A. to 3/8" fine pitch in mild steel.

A new horizontal version of the same operating principles long used in Snow vertical machines. Snow machines reduce changeover time, and cut tooling costs to a minimum. On your next job, let us explain what the Snow method can do.

GASTON E. MARBAIX LTD.

DEVONSHIRE HOUSE, VICARAGE CRESCENT, BATTERSEA, LONDON, S.W.11 **Phone: BATtersea 8888 (8 lines)**

NRP 3489

MATRIX QUALITY

BRITISH BUILT

"American" HORIZONTAL BROACHING MACHINES

Can be supplied with Matrix Designed and Manufactured Tooling to your requirements.

For broaching round, square, hexagonal and other holes, keyways, splines. Also suitable for surface broaching. Easy, quick job change. 48" stroke, normal capacity 10 tons. Broaching speed infinitely variable 5-15 F.P.M. with quick return. Simple stroke and speed adjustment. Single lever control of ram. Hardened and ground ram ways automatically lubricated.

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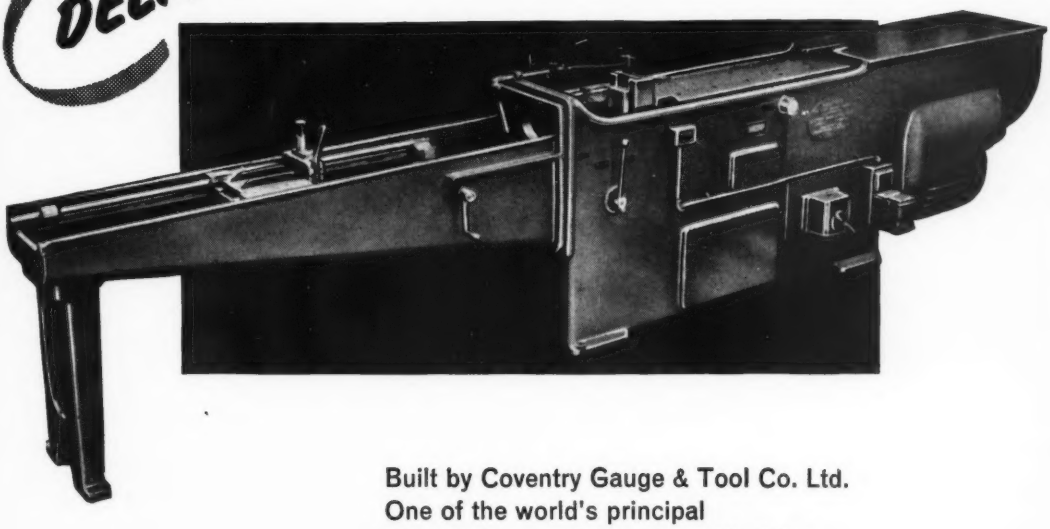

Built by Coventry Gauge & Tool Co. Ltd.
One of the world's principal
Manufacturers of Broaching Machines
and Broaching Tools

For further particulars write or telephone TODAY

ROCKWELL
MACHINE TOOL CO. LTD.

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ABH4 D★

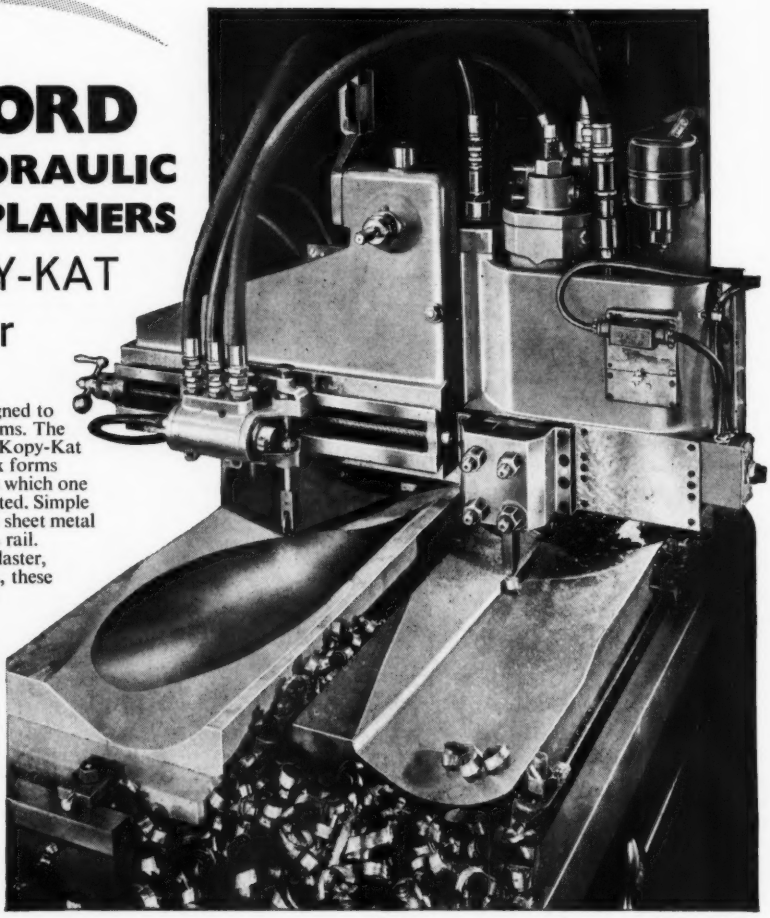
POSITIVE DUPLICATION OF COMPLEX FORMS

—with the ease of Straight Machining

ROCKFORD HYDRAULIC PLANERS with KOPY-KAT Duplicator

These machines have been designed to simplify form-machining problems. The sensitive hydraulic valve of the Kopy-Kat unit transfers simple or complex forms direct to the tool head carrier on which one or more tool heads can be mounted. Simple contours can be machined from sheet metal templates mounted on the cross rail. Inexpensive masters of wood, plaster, etc. can be used for other forms, these being mounted on the machine table or on an auxiliary table if the full machining width is to be utilised. Either type of work is accommodated by simple valve mounting change without disconnecting hoses. Many of these machines are in use producing a wide variety of work including propeller blades, turbine blades and forging dies.

36", 48", 60" and 72" machines with 24" or 32" x 30" capacity. Infinitely variable cutting speeds up to 110 ft./min.



Machining a ploughshare mould board die from a polished original set in a wooden block.

ROCKWELL MACHINE TOOL CO. LTD.

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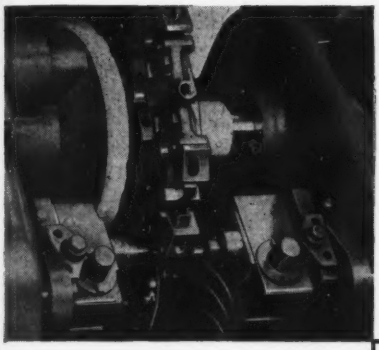
Rockford 1



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way

to produce

pipe fittings

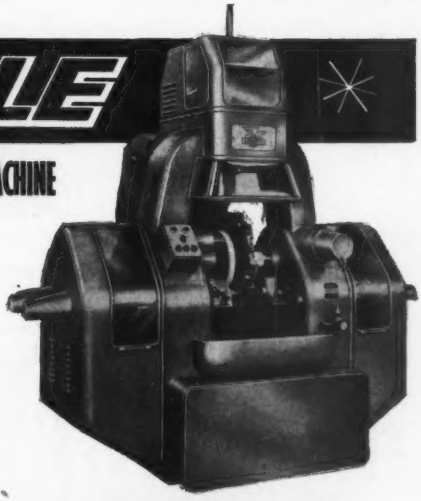
valves

etc.

BETTER • FASTER • CHEAPER

on the

ROTACYCLE



ROTARY AUTOMATIC TURNING AND THREADING MACHINE

CONTINUOUS machining of up to 3 workpieces at each station from 2 or 3 sides SIMULTANEOUSLY

TURNING ● BORING ● THREADING

FACING ● RECESSING

NOW — INCREASED RANGE AND WIDER APPLICATION. 2, 3, 4, 6, 8 and 9-SPINDLE MODELS. 6-SPEED REDUCTION GEARBOXES CAN BE FITTED FOR MACHINING STEEL AND ALL FERROUS METALS.

Please send us drawings or components and we will submit machining times.

*** A SOAG 'SPECIAL' MACHINE YOU CANNOT AFFORD TO BE WITHOUT**

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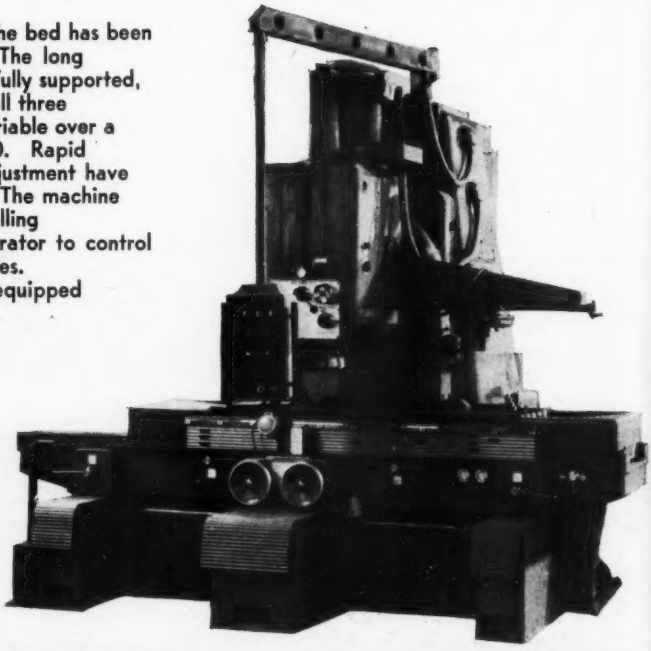
KOLLMANN

AUTOMATIC VERTICAL MILLING MACHINE PROFILING & PRODUCTION

MODEL VF

The guidance of the cross slide on the bed has been designed having three slideways. The long cross slide ensures that the table is fully supported, even in its extreme positions. For all three movements, the feed is infinitely variable over a PIV-gearing in the range from 1:40. Rapid traverse, fine traverse and hand adjustment have been provided for all movements. The machine is centrally controlled from a swivelling pendant station, to enable the operator to control the machine practically from all sides. For profiling the machine can be equipped with automatic copying equipment.



SPECIAL OPTIONAL EQUIPMENT

- Optical measuring device for the longitudinal movement of the table.
- Optical measuring device for the cross movement of the table.
- Climb milling equipment for the longitudinal movement of the table.
- Spindle head to swivel mechanically to either side by 45°.
- Copying equipment with electric tracer control in three dimensions with automatically controlled rapid feeds.
- Automatic retraction of cutter and approach.
- Arrangement of the machine for a programme using feed, rapid traverse and fine traverse in three directions.

SOLE SELLING AGENT FOR U.K.

CAPACITY	VF4	VF5	VF6
Working surface of table	63" x 19½"	71" x 25"	78¾" x 31½"
Longitudinal power movement of standard table	63"	71"	82¾"
Power movement cross	25"	27½"	35½"
Vertical power movement of spindle head	18½"	24¾"	29½"
Distance from centre of spindle to column	25½"	28¾"	37½"
Distance from table to spindle nose	0-23½"	0-29½"	0-37½"
Range of speeds	16-800 r.p.m.	12.5-630 r.p.m.	10-500 r.p.m.
Spindle speeds	18	18	18
Milling spindle motor	18 h.p.	25 h.p.	35 h.p.

Selson MACHINE TOOLS

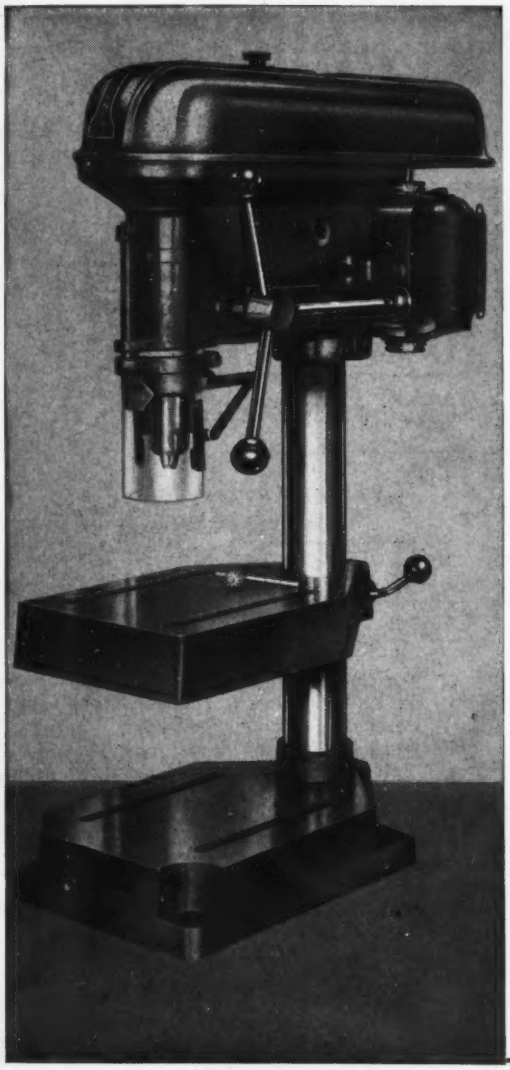
The Selson Machine Tool Co. Ltd

SUNBEAM ROAD, LONDON, N.W.10. Telephone Elgar 4000

STANNINGLEY, Near LEEDS Telephone Pudsey 2241

And at Kingsbury (Nr. Tamworth). Manchester. Glasgow. Swansea. Newcastle-on-Tyne Sheffield. Southampton. Belfast. Bath.

600 GROUP



INCOMPARABLE IN PRICE & QUALITY

- Weight 154 lbs. 70 kgs.
- Five Spindle Speeds
- Throat Depth $7\frac{5}{8}$" : 194 mm
- Column Diameter $2\frac{3}{4}$" : 70 mm
- Quill Diameter 2" : 50·8 mm
- Robust Spindle and Quill Assembly with splined spindle and driving sleeve
- Large working surface to table and base
- Adjustable Depth Stop and Spring-controlled Spindle return

Supplied complete with 0-½in. Chuck, 3 phase motor, rotary on/off starter. Pedestal model £2.15.0 Extra. Single phase electrics £2.10.0 Extra.

Obtainable from all leading Machine Tool Merchants, or write to us for details of your nearest stockist.

£42

DRILTRU MEDDINGS

W. J. MEDDINGS LTD
IPSWICH ROAD, TRADING ESTATE, SLOUGH, BUCKS.
Telephone: Slough 26761 *Telegrams: Pacera Slough*

VISIT US ON STAND
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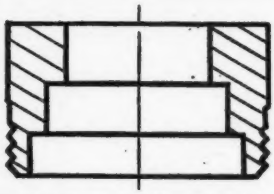
7th European Machine Tool Exhibition, Brussels, September 3-12

Yet another example of PRODUCTIVITY!

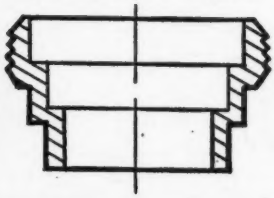
KUMMER

There are many operations where the Kummer K20 can show handsome savings. This is one of many typical examples. Suitable for work on bar, castings, forgings and stampings.



Operation 1
Loading 6 secs
Machining 28 secs
Material—BRASS
(Billet)

SCALE FULL SIZE



Operation 2
Loading 6 secs
Machining 43 secs
Material—BRASS
pre-machined blank
from Op. 1.

K20 Semi-Automatic Twin-Head PRECISION LATHE...

- Work head spindle can automatically operate at high or low speeds according to preselected cutting speeds.
- Camshaft driven from main spindle.
- Cam accelerator reduces machining cycle time.
- Air-operated chucking
- Spindle positioning device for irregular shaped components.
- Easy loading of components into chucks.
- Write for full data.

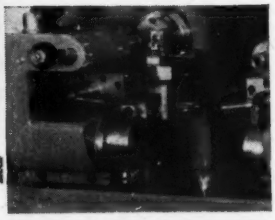


Illustration shows tailstock which is one of the many optional features available.

BRUSSELS FAIR
Visit Stand No. 2207 Hall 2 and see this machine

GASTON E. MARBAIX LTD.

Devonshire House, Vicarage Crescent, Battersea, S.W.11. **Phone: Battersea 8888 (8 lines)**

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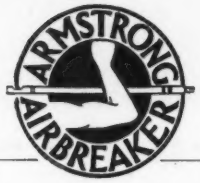


OLIN MATHIESON LIMITED*

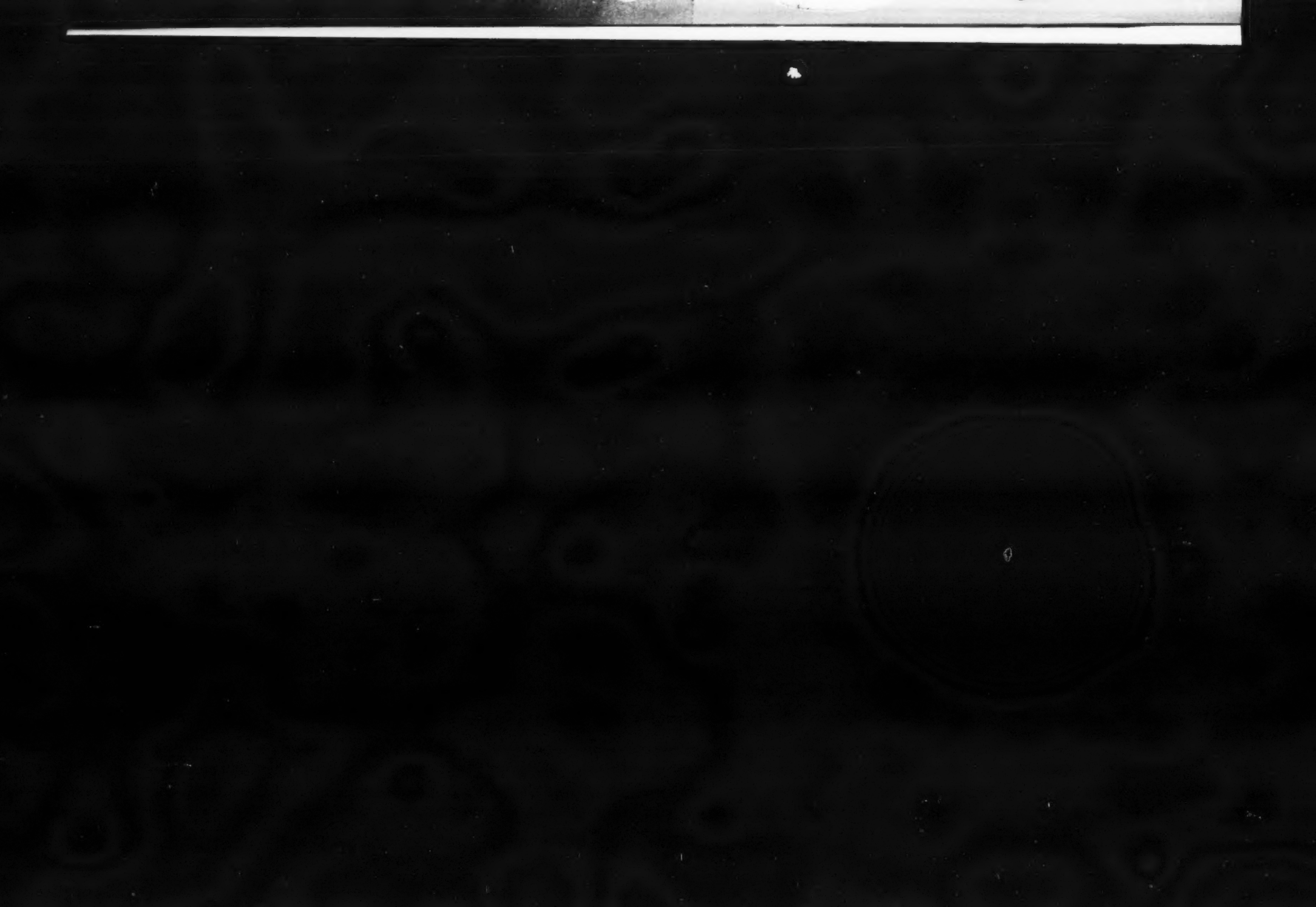
Manufacturers and Suppliers of the Armstrong Airbreaker System on Coal Mining, have available for immediate use the following services at their Perivale, Middlesex, factory.

1. Hydraulic Pressure Testing to 30,000 lbs. per sq. in.
2. Pneumatic Pressure Testing to 12,000 lbs. per sq. in.
3. Hardness Testing by either Brinell or Rockwell Systems.
4. Material analysis and certification.
5. Press Capacity.

Please address all enquiries to :

CHIEF ENGINEER,
6 WADSWORTH ROAD,
PERIVALE, GREENFORD,
MIDDLESEX.
Telephone: Alperton 2241 (7 lines)

* SUBSIDIARY OF OLIN MATHIESON CHEMICAL CORP U.S.A.



KEIGHLEY AK

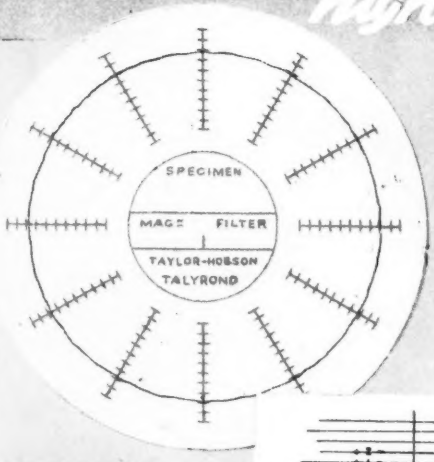
fully automatic internal grinder

quicker set-ups

faster cycles

higher precision

ONE OF THE NEWALL GROUP



Graph shows accuracy within 0.0002" achieved in production of a batch of components with 1 11/16" dia. × 1" bore. Production rate—100/hour floor to floor, stock removal—0.008".

Roundness recorded by TALYROND—within 0.00004".

Precision built to exceptionally robust proportions, operated by single lever control after initial setting up, and arranged for both gauge and diamond sizing to ensure maximum utilisation, the fully automatic AK is unsurpassed for accuracy, component finish and fast cycles in grinding holes from ¼" to 6" diameter with a maximum depth of 6", and for taper bores up to 60° included angle.

a quality product of
KEIGHLEY GRINDERS (MACHINE TOOLS) LTD

KG MACHINE TOOLS

NEWALL GROUP SALES LIMITED

PETERBOROUGH, ENGLAND

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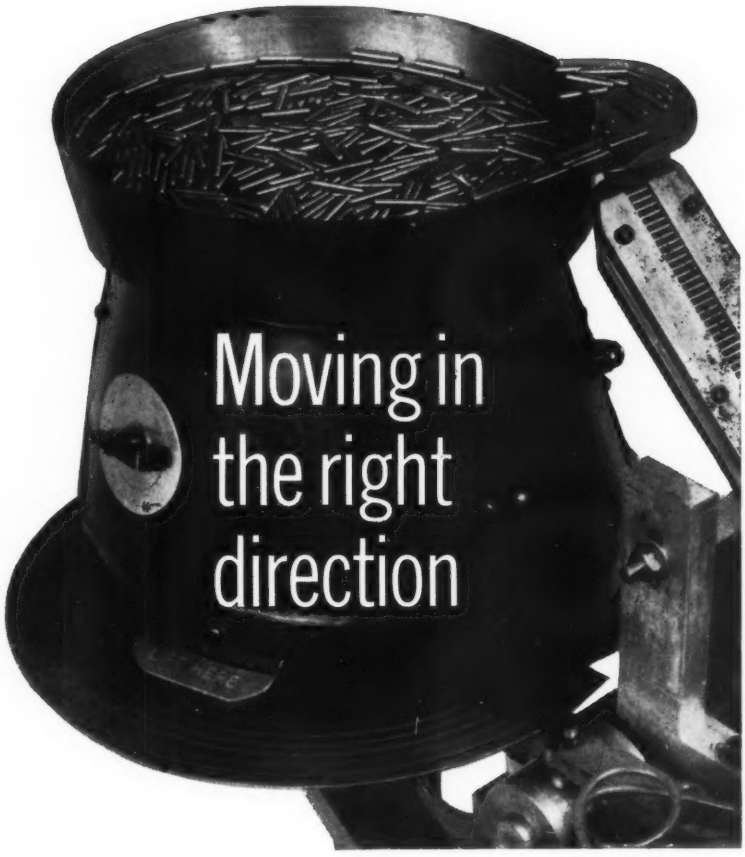

Moving at the right speed, right way up, right way round, one by one. Fragile parts or finished products, 6-inch metal bushes or ¼-inch glass tubes, SYNTRON Vibratory Small Part Feeders marshal them all, smoothly, accurately, untiringly. Costly hand feeding and the possibility of still more costly misfeeding are eliminated. Please write for Publication R 598, which gives full details.

SYNTRON small part feeders

The range of Syntron Electric Vibratory Equipment includes vibrators, feeders, feeder machines and packers for use with powders, gravels and similar materials. Full details on request.

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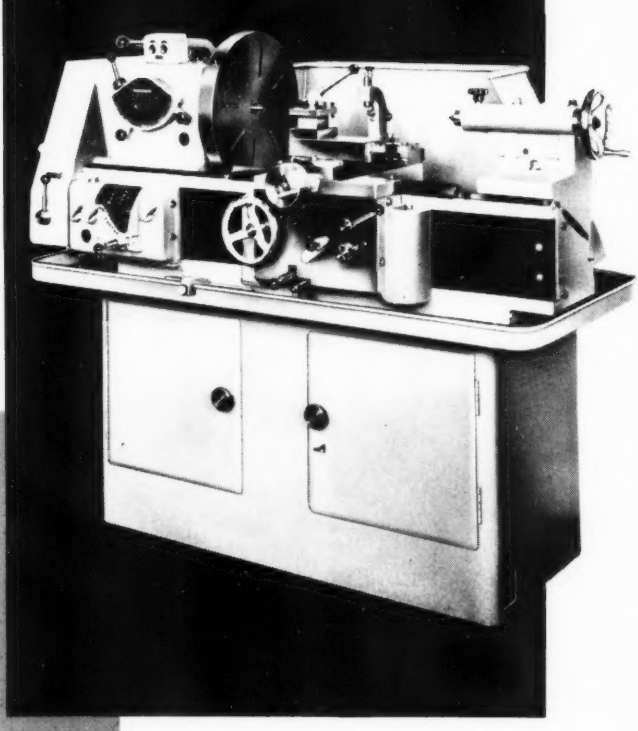
EASIER THAN EVER TO OPERATE!

WILLSON MARK ONE

6½" CENTRE LATHE *with all the 'PLUS' features*

- Maximum safety and protection-combined with high production capacity
- Flame hardened bed
- Wide speed range 52/954 r.p.m.
- Taper roller bearing spindle



The WILLSON Inclined Bed Centre Lathe Mark I, represents a unique combination of time-proven design principles, modern refinements, and striking new advances in machine tool technology. Taper roller bearings, totally enclosed motor, extreme rigidity with clean chip flow lines; these will be found on WILLSON Lathes, and in addition are to be found such striking features as the fully protected double inverted vee bed, inclined to admit a full 17½in. dia. swing by 7½ swing without gap and shed swarf; complete enclosure of screw and shaft; isolation of motor upon opening change wheel guard or locking compartment door, etc.

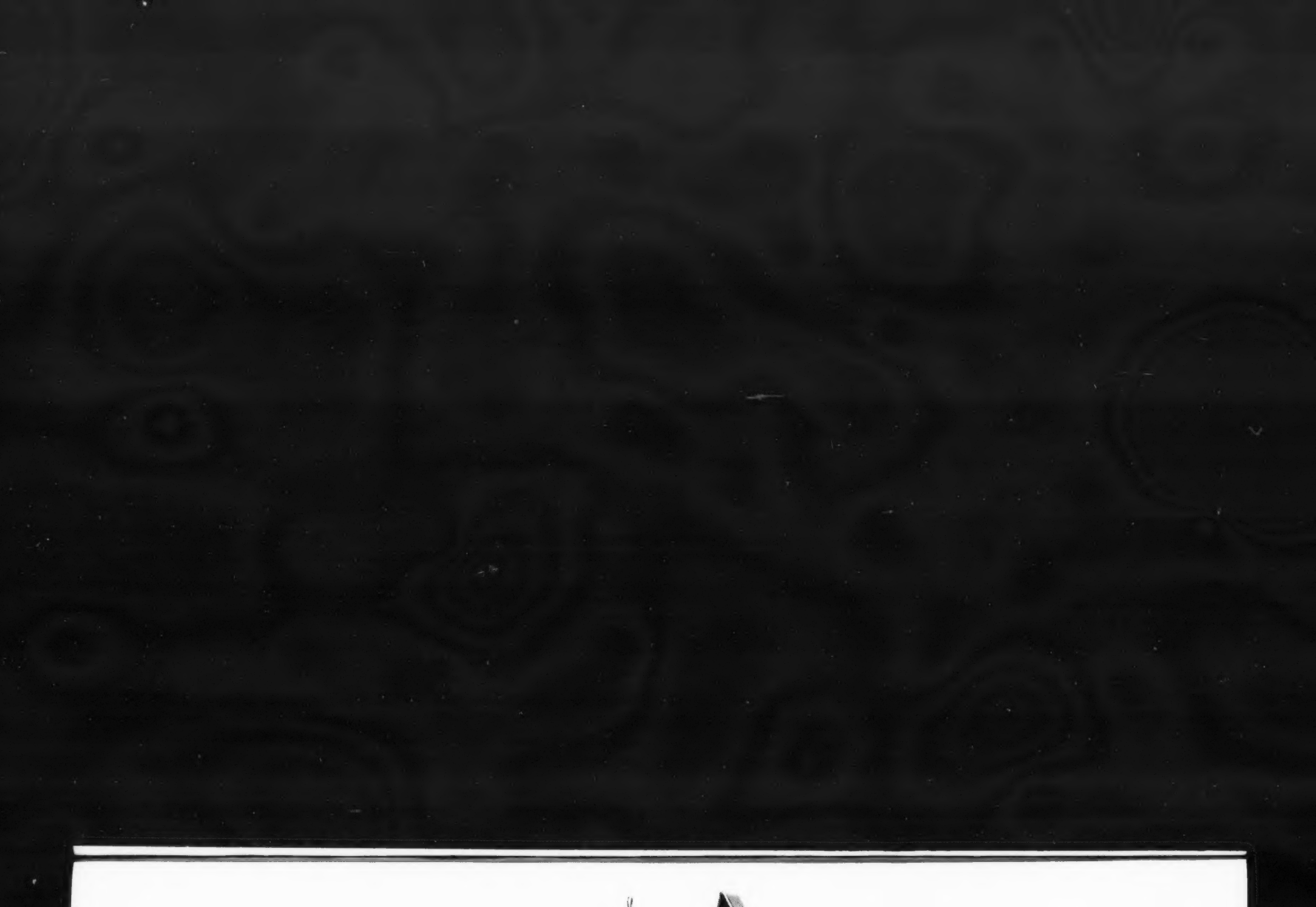
Write for full details of this advanced machine and of its many PLUS FEATURES.

Also available are Capstan and Copying Models. Ask for complete details

WILLSON LATHES LTD

Telegrams: Lathe, Halifax **Telephone: Halifax 5844/5**

SHAY LANE · OVENDEN · HALIFAX · ENGLAND



WARNER Electric Brakes and Clutches offer better-than-ever efficiency in machine control! Their design is a lot simpler than that of conventional means. Brake and clutch components operate by electro-magnetic engagement of two main parts—the disc shaped magnet and the armature; there is virtually no mechanical movement. Operation is very much more flexible, sensitive and incomparably faster.

Warner Units offer—to increase production—

- *Elimination of complex equipment.*
- *Rapid engagement.*
- *Cushioned stopping and starting.*
- *Smooth tensioning, indexing.*
- *Fully locked in torque transmission.*
- *New possibilities in machine design.*

800% RISE IN SALES OF WARNER UNITS

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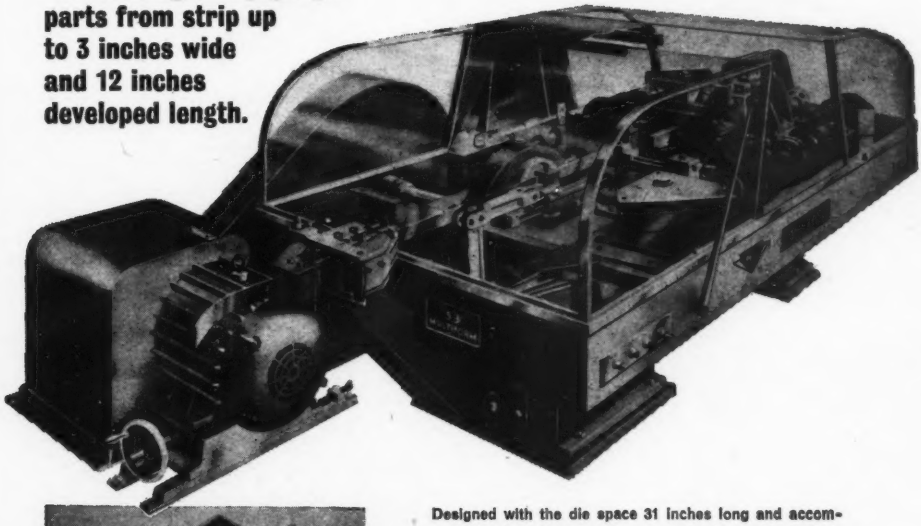
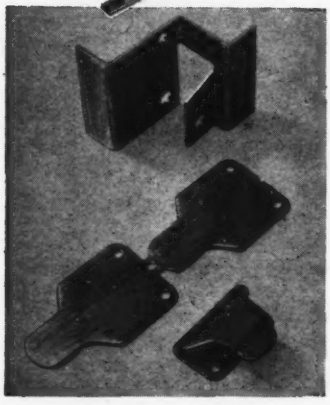
HEENAN *Multiform* S3

For forming heavy gauge parts from strip up to 3 inches wide and 12 inches developed length.





Designed with the die space 31 inches long and accommodating three individually operated diesets, if required, each 10 inches long, the Heenan S.3 Multiform is particularly suitable for the automatic forming of parts requiring substantial presswork, such as piercing, stamping, coining, blanking, embossing and trimming, using progression tooling. Press rams can be operated from front or rear, with 30 tons loading to each ram.

Output rates are variable from 40 to 120 parts per minute. The machine is particularly robust and has been designed to cater for the particularly heavy loads exerted when working on heavy gauge strip.

If fast multi-forming is new to your Company you may freely borrow a 16 m.m. colour film "The Heenan Multiform" which fully describes the technique. Write sole agents below.

WICKMAN LIMITED

FACTORED MACHINE TOOL DIVISION, BANNER LANE, COVENTRY. Tel. Tile Hill 65231

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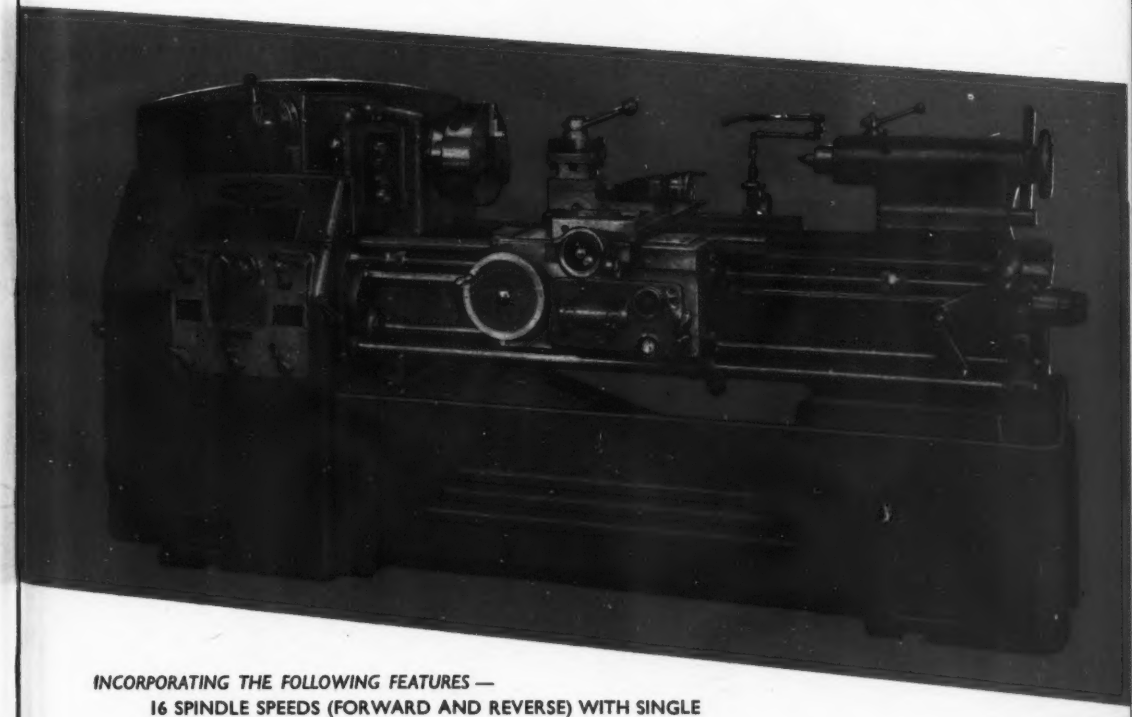
Introducing the NEW

MODEL 'H' No. 17 PRECISION LATHE



INCORPORATING THE FOLLOWING FEATURES —

16 SPINDLE SPEEDS (FORWARD AND REVERSE) WITH SINGLE LEVER CONTROL.
CAM-LOCK SPINDLE NOSE, 2¾" DIA. HOLE.
SINGLE HELICAL GROUND GEAR, FINAL DRIVE.
TOTALLY ENCLOSED GEARBOX AND APRON.
60 DIRECT CHANGES OF THREADS AND FEEDS.
PRECISION LEADSCREW AND COMPENSATED THRUST.

ALSO AVAILABLE —

ALTERNATIVE SPEED RANGE, BED LENGTH, RAPID POWER TRAVERSE, TWO-SPEED TAILSTOCK.

STANDARD MODEL
20" SWING OVER BED
42" BETWEEN CENTRES
SPINDLE SPEEDS 15-1000 R.P.M.

HYDRAULIC PROFILING EQUIPMENT
TAPERING EQUIPMENT ETC.

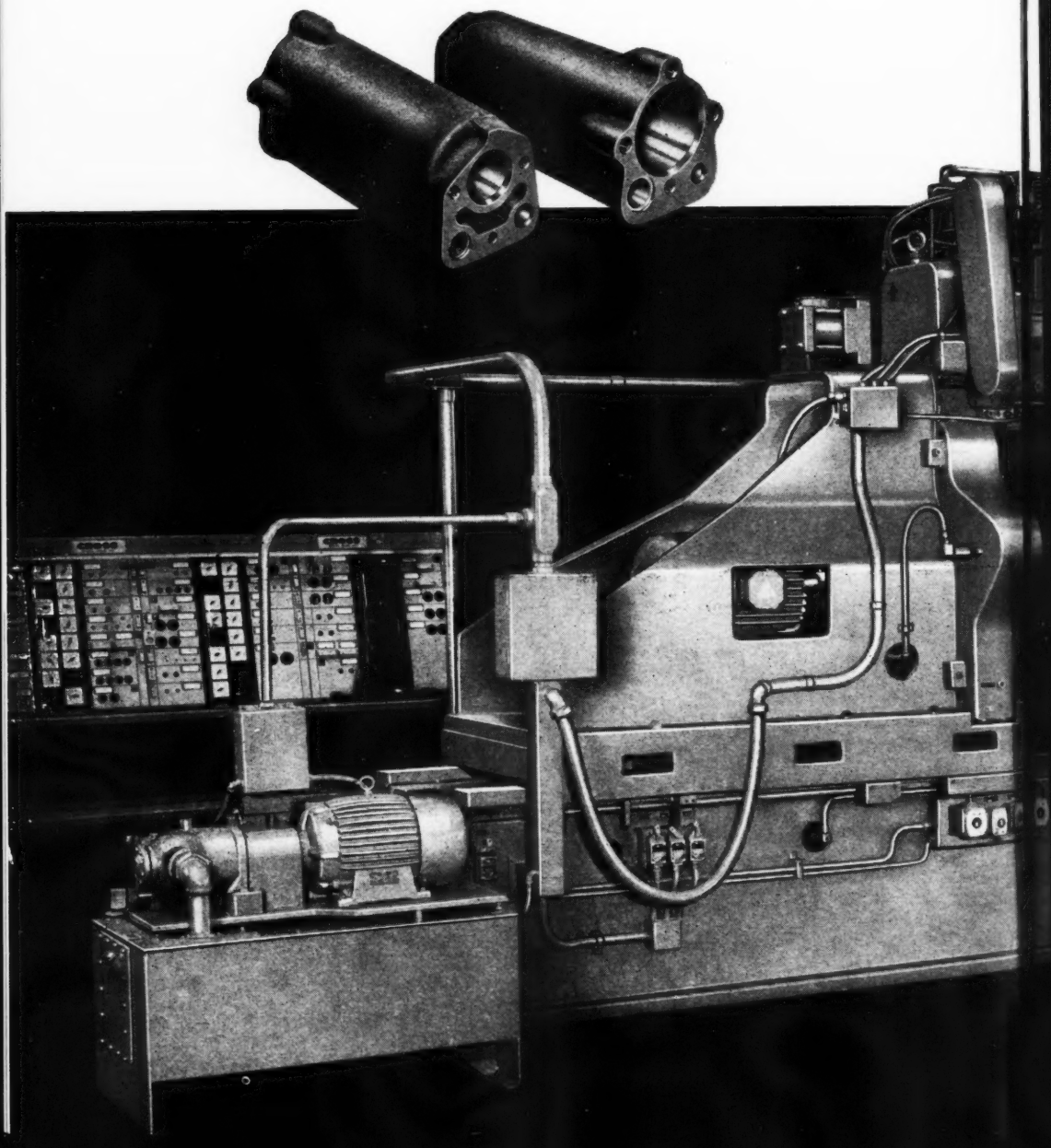
Telephone:
HARLOW 2351

HOLBROOK MACHINE TOOL CO. LTD.

CAMBRIDGE ROAD, HARLOW, ESSEX

New Cross Trunnion Machine with Greater Flexibility

Processes remote accessory cylinders of different designs and different materials



Another Automation First by Cross

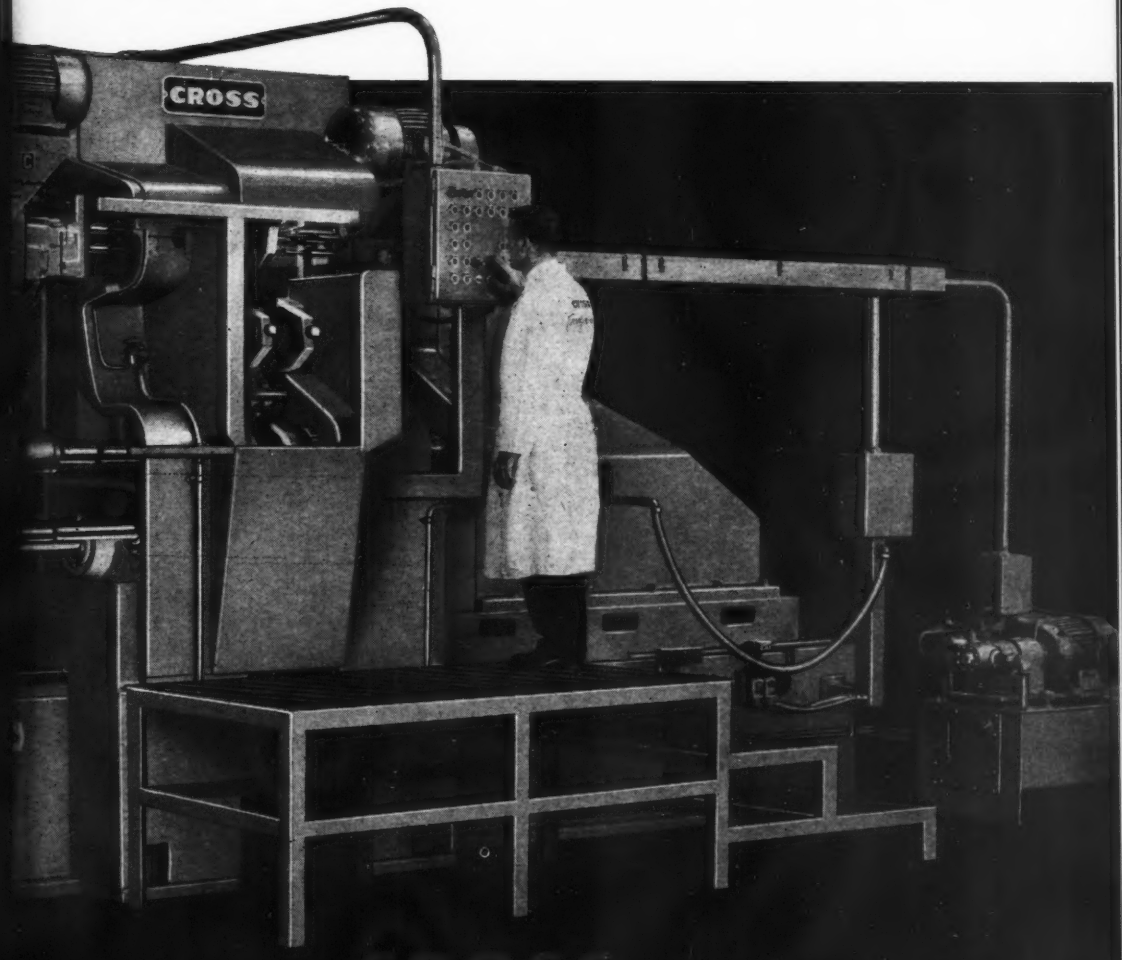
Recent developments by Cross have resulted in trunnion machines that perform a variety of operations on families of parts with improved accuracy and at a higher rate of production than previous equipment.

A typical application of the new design concept is the processing of remote accessory cylinders which vary in both size and material. Different lengths are handled by changing a few tools, replacing some fixture details and adjusting the feed strokes. Both nodular and grey iron castings are processed by changing the speeds and feeds.

Similar operations such as rough, semi-finish and finish boring; drilling; counterboring and chamfering are completed by spindles in the two main heads. Dissimilar work such as tapping, facing and grooving are done by four auxiliary heads.

Extremely close tolerances are maintained through single clamping of the part, precision indexing of the trunnion and boring bars which are accurately guided in the trunnion supports.

Future part design changes can be accommodated easily because of the extreme flexibility of the machine.



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RD

The NEW SICMATIC

Automatic and Semi-Automatic Hydraulic Profiling Lathes

Specification

Bore of spindle	2¼in.
Spindle nose	5in. A.S.A.
Max. swing over bed	15¼in.
Max. swing over saddle ..	9¾in.
Max. length turned	27½in.
Hydraulc traverse of copying slide	4in.
Hydraulic feed of tailstock spindle	4¾in.
Number of feed rates to copying slide	48
Max. tool pressure ..	1,300 lbs.
Approx. net weight ..	5,000 lbs.

7 POINT FEATURES INCLUDE

1 Capacity.
2 Duplomatic Hydraulic Styems.
3 Hardened Bed Slideways.
4 Auto cycling up to six depths of cut.
5 Hydraulic tailstock for drilling and boring.
6 Uses template or existing component.
7 Eight models to choose from.

Basic price under £2,500.

QUICK DELIVERY

Daily demonstrations at our works

HERBERT WIDDOWSON & SONS LTD

Canal Street Works, Nottingham

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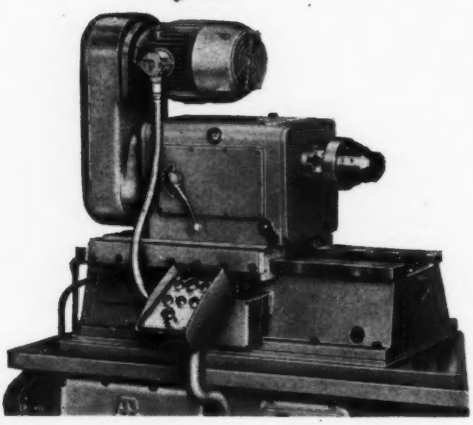

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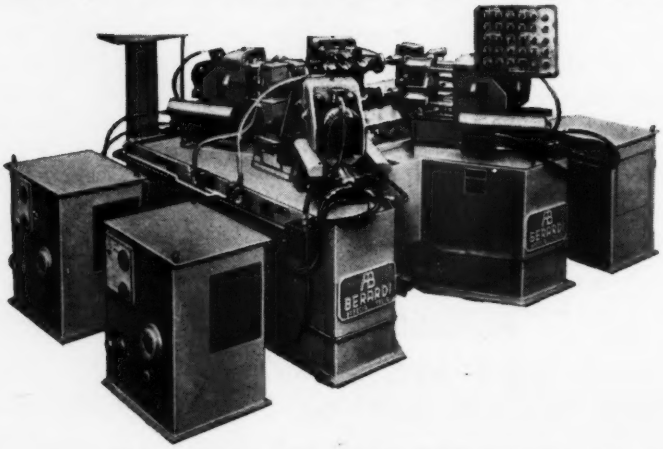

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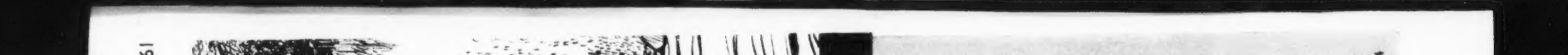

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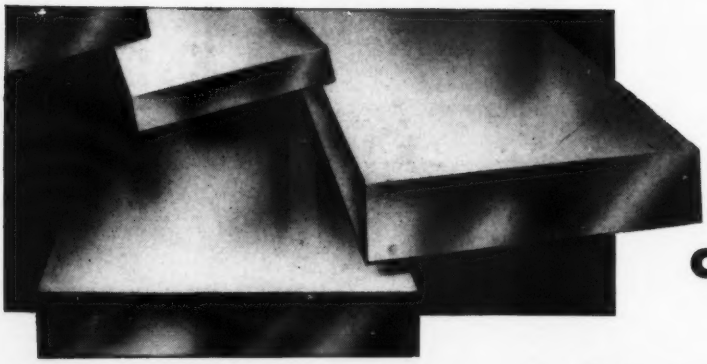

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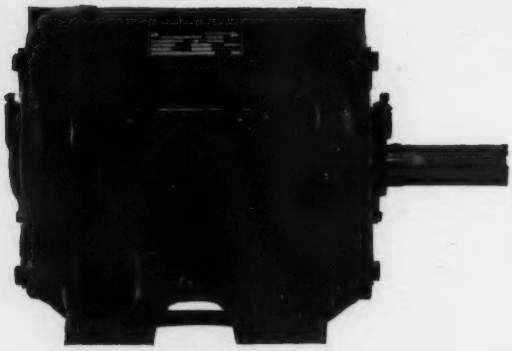

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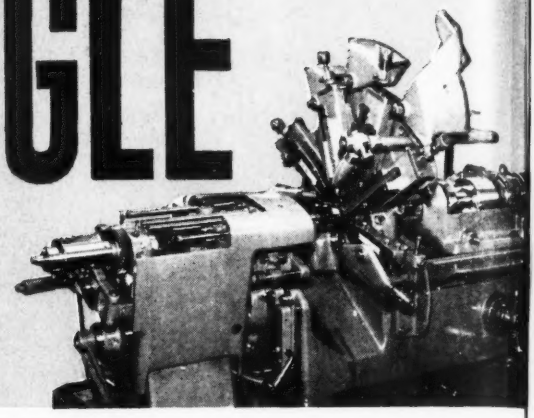

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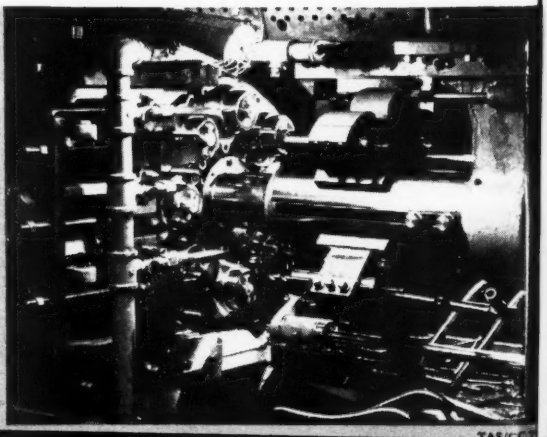

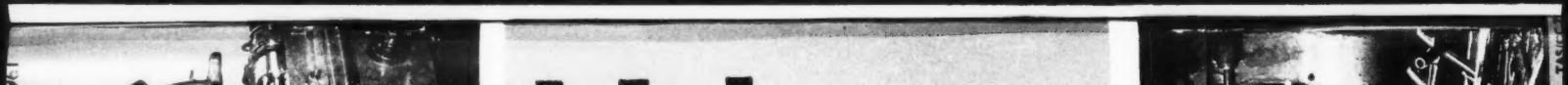

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Abstracts of Principal Articles

Making Petrol Dispensing Pumps .. P. 292

In this article, which is the second in a series concerned with the production of petrol dispensing pumps at the Crayford works of Vickers Armstrongs (Engineers), Ltd., reference is first made to operations on cast-iron air separator housings. An Archdale radial drilling machine is equipped with a special fixture, incorporating five Par-A-Matic pneumatic drills, whereby ten holes are drilled in a flange while other holes are being drilled, spotfaced and tapped, with the main machine spindle. Air for the drills is delivered by way of a supply trolley. Main pump bodies are milled on a Cincinnati duplex machine, six at a time, and the company has built a fixture with air-hydraulic clamping arrangements. Slots are milled in four cast-iron rotor bodies simultaneously, using an indexing fixture and carbide-tipped cutters. A fixture with special support arrangements is used to hold a light alloy casing while the end flanges are milled on an Archdale duplex machine. (MACHINERY, 99—9/8/61.)

Standardization of Machine Tools in East Germany .. .. P. 300

This article is concerned with certain aspects of the work of the East German Institute of Machine Tool Engineering, particularly in connection with the introduction of a system of unit construction. Among machine tools to which this principle has so far been applied are lathes, bevel gear generating machines gear shapers, plano-milling machines and planers, and vertical honing machines. Other work undertaken by the institute has included the development, in collaboration with certain machine tool factories, of unit heads suitable for such operations as drilling, tapping, boring, milling and grinding. In-line and rotary transfer machines, also multi-way drilling machines, can be made up from the range of units available, which includes beds, columns, tables, and slides in a number of sizes. Attention has also been paid to the development of tools for performing multiple operations. An example of such tools is a combination roughing and finishing drill fitted with a single reaming blade of tungsten carbide. (MACHINERY, 99—9/8/61.)

Automatic Detection of Broken Tools P. 318

The automatic detection of broken tools is essential in connection with high-production installations, such as transfer machines and link-lines, if time-consuming and costly interruptions are to be avoided. One method of detection described in this article involves the use of a photo-electric cell and a number of transmitters for monitoring a multi-spindle drilling machine. With another arrangement, the electrical inductance of tools is measured, and if a tool is broken the consequent reduction in inductance is utilized to stop the cycle. (MACHINERY, 99—9/8/61.)

Diaphragm Chucking .. .. P. 320

Increasing use is being made in production engineering of diaphragm-type chucks of various designs, and after discussing the principle of operation of such equipment this article describes some typical applications. For holding external spur gears, one type of chuck is provided with interchangeable parts to accommodate workpieces of different sizes, and incorporates ball-ended pegs which engage with the gear teeth for clamping and locating. Another type of chuck is employed to hold internal gears during tooth-cutting, and is designed to resist the high torque loads associated with this operation. (MACHINERY, 99—9/8/61.)

A Quick-acting Centrifugal Governor P. 324

It was required to control the speed of a steam turbine installed in a chemical plant, and the use of a conventional governor was not permissible since a virtually instantaneous response to the critical speed was essential. The governor which was designed for this duty, and is described in this article, is unconventional and incorporates weighted arms which are pivoted about an axis at right-angles to that of the rotation of the governor. The weights are held in a predetermined position by means of a special C-spring, and when the speed of rotation reaches a certain value, the centrifugal force is greater than that exerted by the spring, and the weighted arms change positions very rapidly. This movement is employed to actuate a speed control in a conventional manner. As the rotational speed falls, the C-spring reasserts itself, and the weighted arms change position rapidly once more. (MACHINERY, 99—9/8/61.)

IN FORTHCOMING ISSUES

Producing gas turbine components—Planning for the A.E.I. Numeritrol numerical control system—The activities of Paterex, Ltd.

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EDITORIAL

Overseas Trade in Metal Products

The lack of balance between United Kingdom exports—visible and invisible—and imports continues to cause anxiety, and it is evident that still greater efforts must be made to expand sales in overseas markets. To this end, we must concentrate even more on achieving higher productivity and improved product quality, to enable us to compete more effectively, and particular attention must be paid to the reduction of delivery periods quoted, and the maintenance of delivery promises. There are, of course, many other factors which influence sales abroad, and the nature of the services offered for repair and replacement of parts can be of particular importance. Numerous British companies have achieved outstanding successes in the export field during the post-war years, sometimes on account of the special merits of the products which they have had to offer, and sometimes because the managements have shown the necessary determination to take advantage of the opportunities afforded.

One noteworthy aspect of the trade returns during recent years has been the substantial growth in the value of exports of some of the principal metal products, which have accounted for an increasingly large proportion of the total, and it appears that future overall expansion can best be promoted by concentrating on these products more and more. Of particular significance are the results that have been obtained under the heading "machinery other than electric", which necessarily covers a very wide range. In 1956, the value of such exports amounted to £503·6 million out of a total of £3,172 million, so that they accounted for 15·9 per cent of all exports of produce and manufactures. For the first half of this year, exports of "machinery other than electric" were valued at £419 million, which represented 22·4 per cent of the export total of £1,871·5 million.

The next most important group of exports is "road vehicles and aircraft", which reached a value of £372·5 million in 1956 or 11·7 per cent of the overall figure for the year. During the first six months of this year there was a sharp drop in exports under this heading, in comparison with the results achieved in the corresponding period of 1960, mainly on account of the much smaller number of cars consigned to the United States (9,428 as against 103,329). Even so, the value of road vehicle and aircraft exports for the past six months was £232·8 million, so that they provided 12·4 per cent of all exports, by value.

It is interesting to examine the situation from another standpoint. If the values for "machinery" and "vehicles" are deducted, it is found that the totals for all other exports were £2,296 million in 1956, and £1,219·6 million in the first half of this year, representing an annual rate of £2,439 million. In other words, exports, apart from those in the two selected groups, increased by only 6·2 per cent as between 1956 and the first half of 1961. During the same period, despite the recent setback, exports of "road vehicles and aircraft" rose by 25 per cent, and exports of "machinery other than electric" by no less than 66·4 per cent.

Should these trends continue, then by 1966 the value of "other" exports will have increased to £2,590 million, the value of "road vehicle and aircraft" exports to £582 million, and the value of "machinery other than electric" exports to £1,394 million. By 1971, moreover, the corresponding figures will be £2,750·6 million, £727·5 million, and £2,319·6 million. In other words, the two groups together will account for considerably more than half of all exports.

Other groups of exports of metals and metal goods which showed more than average increases during the period from 1956 to the first half of this year are "iron and steel" and "electric machinery, apparatus and appliances." For the former, the values for 1956 and for the first six months of 1961 were £173·3 million and £113·7 million (annual rate of £227·4 million), and for the latter, £217·3 million and £135 million (annual rate £270 million).

For purposes of comparison it may be noted that imports of "machinery other than electric" rose from £110·5 million in 1956 to £126·6 million (annual rate £253·2 million) in the first six months of this year, imports of "electric machinery, apparatus and appliances" from £23·7 million to £30·4 million (annual rate £60·8 million), and imports of "road vehicles and aircraft" from £23·5 million to £19·6 million (annual rate £39·2 million), whereas imports of "iron and steel" fell from £105·6 million to £25·9 million (annual rate £51·8 million).

So far, the very substantial achievements of the makers of machinery, road vehicles and aircraft

(*Continued on page* 336)

Making Petrol Dispensing Pumps

Methods and Equipment Employed by Vickers Armstrongs (Engineers), Ltd.

By P. A. SIDDER?, Chief Associate Editor

IN AN EARLIER ARTICLE* reference was made to the manufacture of petrol dispensing pumps by Vickers Armstrongs (Engineers), Ltd., Crayford, Kent, under an arrangement with the Gilbert & Barker Mfg. Co., Springfield, U.S.A. Machining of metering pump bodies was described, also the production of brass cylinder liners, which are pressed into the bodies on a special air-operated machine built by the company. Machining operations on some other petrol pump components are here considered.

Each pump incorporates a cast-iron component, known as an air separator body. One of these castings is seen at the upper left in Fig. 1, and it will be observed that it is of bell shape, with external strengthening ribs and a flange at the open end. There is a large facing and a smaller boss at one side, and a second small boss at 180 deg. to the first.

Castings are faced and bored on a Ward No. 8 turret lathe, and a component after the completion of this stage is seen at the upper right in Fig. 1. From the Ward lathe, the workpieces are passed to an Archdale radial drilling machine, and a casting in the condition in which it leaves this machine is seen in the centre of the illustration. The set-up on the Archdale machine provides for boring a cored hole *A* in the large facing, machining a concentric spot-face *B*, of 3-in. diameter, and producing a chamfer at the open end of the hole, with a combination tool; tapping the bored hole 2⅛ in. diameter by 16 t.p.i. Whitworth form; drilling and tapping the two smaller bosses ⅜-in. B.S.P., as seen at *C*; drilling a ⅛-in. diameter hole *D* through the metal at the bottom of one of the smaller tapped holes; and drilling ten holes ⅜ in. diameter in the flange. Fig. 2 is a general view of the Archdale machine, set-up for these operations.

The Archdale machine has a heavy-duty right-angle support mounted on the baseplate, and to the upper face of this support is secured a fixture built by the company. Constructed by welding from steel plate, the fixture has a stirrup-shaped work-support, as indicated at *A* in the close-up view, Fig. 3. The work-support is free to rotate, on a horizontal axis, between the main frame of the fixture, and the support bracket *B* at the opposite end of the base. Holes in the circular end-plate of the work-support are engaged by the hand-operated locating pin *C* to lock the support in various angular settings to suit the operations to be performed.

A partly-machined casting is loaded to the work-support through one side of the stirrup-shaped frame, and the bored end is engaged with a spigot on the end plate. The angular disposition of the casting is controlled by two pegs that project from the end plate, and engage a flat at one side of the

* MACHINERY, 98/1332—14/6/61.

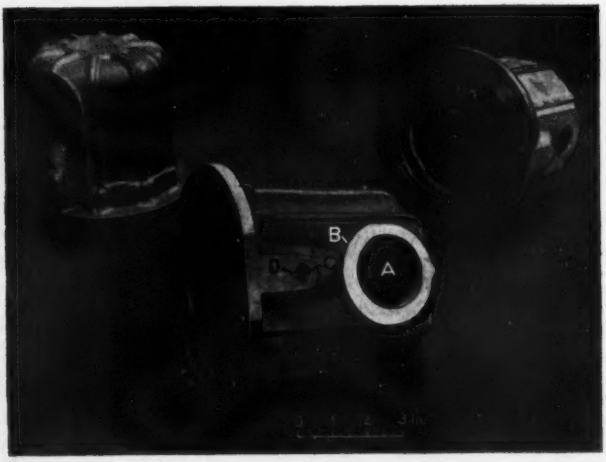


Fig. 1. An air separator body on which drilling, tapping and spotfacing operations have been performed is seen in the foreground. In the background at the right, is shown a component after the preceding operation stage performed on a Ward turret lathe, and at the left, an unmachined casting

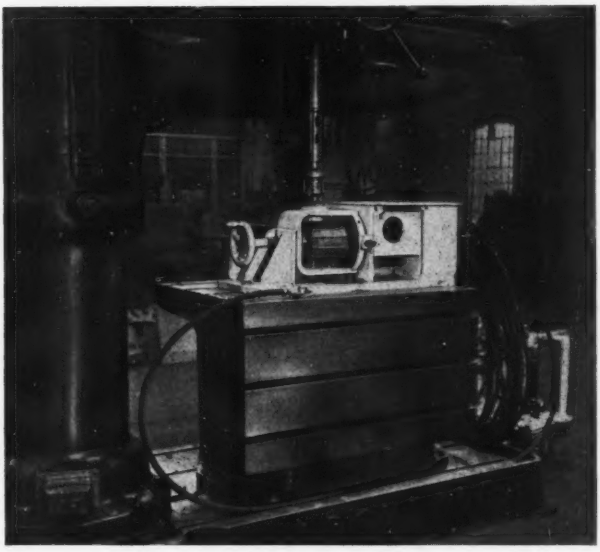


Fig. 2. The set-up on an Archdale radial machine for drilling, spotfacing, and tapping air separator bodies at the Crayford works of Vickers Armstrongs (Engineers), Ltd.

cast flange. Thus positioned, the casting is secured by a clamp pad *D*, which is pivotally mounted on a screw that passes through the left-hand end bearing for the work-support, and is advanced or retracted by turning the handwheel *E*. When the workpiece has been clamped, additional support is provided by bringing a screw-operated jack-pad *F* into contact with the casting, in line with—but on the opposite side to—the large facing.

The main frame of the fixture houses five Aro-Broomwade Par-A-Matic type PO-14-2A air operated drilling units (as described in MACHINERY, 94/605—18/3/59), and the ends of these units are indicated at *G*. Each unit is held in a split circular clamp, and secured by a single socket-head screw, so that it can be readily removed if required. In Fig. 3, the hinged cover that normally encloses the top of the main frame is raised, and the ends of the drilling units can be seen through the circular opening in the frame side member, also below. By setting a control knob, each Par-A-Matic unit can be arranged to operate in accordance with any one of three systems, as follows: —(*a*) from a single air line which supplies both the spindle drive motor and the built-in feed cylinder, a constant drilling feed rate then being obtained, with spring return of the spindle; (*b*) from two air lines, one of which serves the drive motor and the other the feed cylinder, the feed and return rates then being the same, and steplessly adjustable, by means of a needle valve, from 0 to 8 in. per sec.; and (*c*) from two air lines, with adjustable feed rate and spring return of the spindle. The third arrangement is employed by Vickers Armstrongs, and the spindle of each unit is run at 1,400 r.p.m. and is

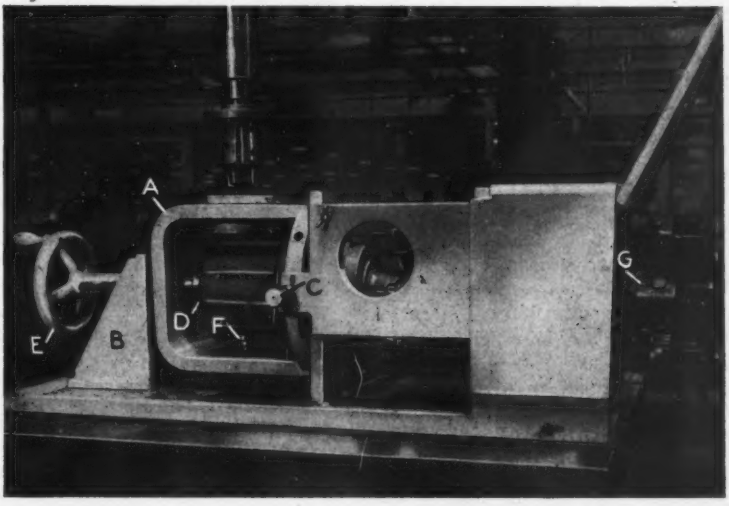


Fig. 3. Close-up view of the fixture on the Archdale radial drilling machine. At the right may be seen the air-operated tools for drilling the holes in the flange while the other operations are being performed

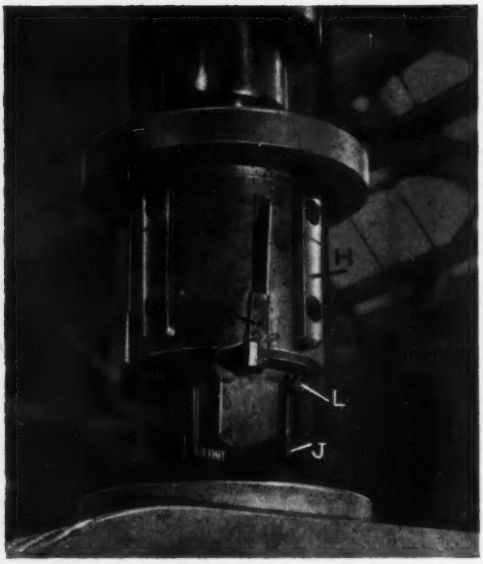


Fig. 4. This multiple tool is employed on the Archdale machine for boring, spotfacing, and chamfering a hole in each air separator body

fitted with a chuck of $\frac{5}{16}$-in. capacity.

Operations on the Archdale machine are performed in two stages. First, with the fixture in the position shown, the large hole is bored, spotfaced, chamfered, and tapped, and one of the smaller holes is drilled and tapped. During these operations, the automatic cycle of the Par-A-Matic units is started, and five of the holes in the flange are drilled. Next, the work-support of the fixture is inverted, and the remaining small hole is drilled and tapped. At the same time, five more holes are drilled in the flange by the Par-A-Matic units. Drills used in these units have points of 140-deg. included angle, to ensure that they break through the flange cleanly. The end of the fixture which houses the Par-A-Matic units is padded with polythene foam material, in order to reduce noise.

The combination cutter used for the boring, spotfacing, and chamfering operations is seen in Fig. 4. It has a steel body fitted with four bronze pads *H* that bear against the bore of the large guide bush in the work-fixture. There are four boring teeth, as at *J*, formed by wedge-type inserts, and four spotfacing teeth, of similar type, as at *K*. A single tool-bit *L* provides for chamfering. The inserts and tool-bit were supplied by English Steel Tool Corporation, Ltd., and are provided with brazed on tips of Escalloy tungsten carbide.

AIR SUPPLY TROLLEY

For controlling the air supply to the Par-A-Matic units there is a lever-operated valve at the rear of the fixture base, adjacent to the clamping handwheel. This position was selected to ensure that the lever is not inadvertently reset by the operator while loading or changing the tools in the spindle of the Archdale machine. Compressed air is delivered to the units by way of flexible hoses connected to outlets on a special trolley, which is just visible at the right in Fig. 2.

A close-up view of the trolley, which was designed and built by Vickers Armstrongs, is given in Fig. 5. It has a wooden base with two rubber-tyred wheels, and steel frames at either end support the manifold pipes and other units. Air is delivered to the trolley by way of pressure hose *M*, of 1-in. bore, which is connected to the shop

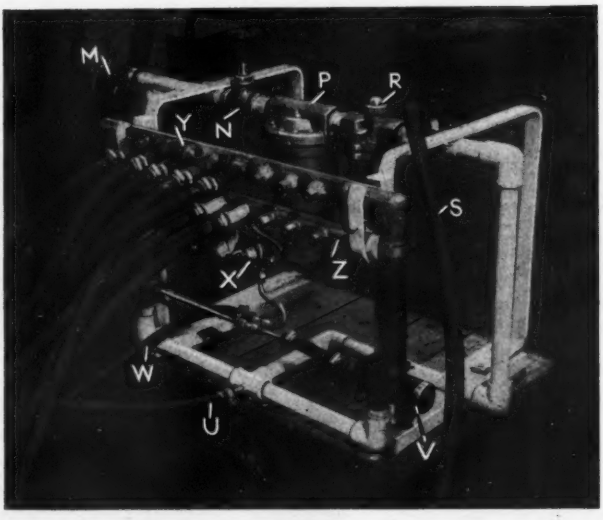


Fig. 5. This air supply trolley has been developed by Vickers Armstrongs (Engineers), Ltd., for the control and delivery of compressed air to the tools in the fixture on the radial drilling machine. Incorporating valves, filter, lubricator, and multiple outlets, it can be used for other duties

air supply line by a quick-release coupling. The hose is connected to the upper, central, run of pipe on the trolley, and this pipe incorporates a main shut-off valve *N*, a Norgren filter *P* and a Norgren lubricator *R*. On the "downstream" side of these units there is an outlet for the delivery of air to the hose *S* which serves a blow-gun on the machine.

The air supply pipe connects with a T-piece at the front of the trolley base from which an outlet *U* provides for the delivery of air to the control valve on the fixture. From the T-piece, pipes branch outwards to the inlet connections of two valves, as at *V*. These Maxam 3-way, pilot operated, automatic return valves are of the "normally off" type. A hose *W* from the Maxam control valve on the fixture is coupled to an adapter, from which connections lead to the pilot inlets of the 3-way valves, also to the pressure reducing valve *X*. When the control valve lever is moved to engage the Par-A-Matic units, air passes to the 3-way valves, which are reset to connect the main inlets to the upper manifold pipe *Y*. At the same time, air passes through the reducing valve to the lower manifold pipe *Z*. Each manifold pipe has eight outlet connections, only five of which are used for this application, and hoses lead from the manifold *Y* to the inlets for the motors of the Par-A-Matic units. Hoses from the manifold *Z* connect with the feed cylinder inlets of the units, and the thrust applied to the drills can be regulated by adjusting the reducing valve *X* on the trolley.

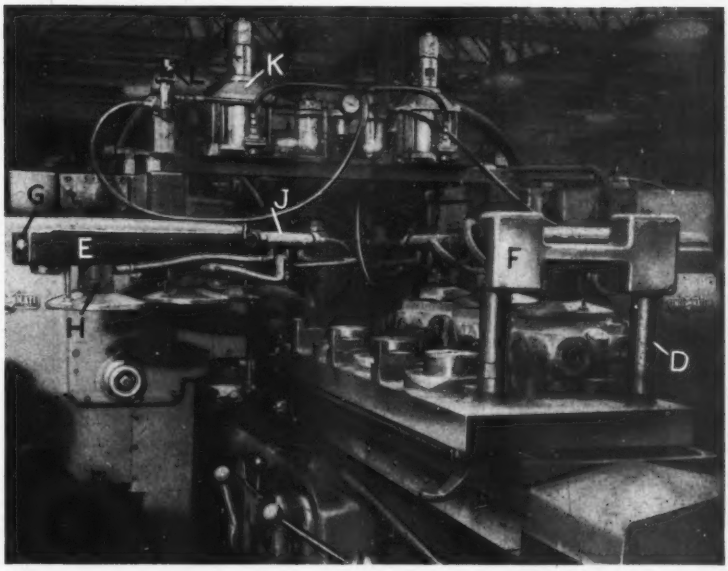


Fig. 7. The set-up on a Cincinnati duplex machine for milling the feet on six main pump bodies at one setting. The fixture has air-hydraulic clamping arrangements

Fig. 6. A main pump body is seen at the right, with a locating plug in position, before the milling operation on the feet. At the left is seen a milled casting

MILLING MAIN PUMP UNIT BODIES

Bodies for the main pump units of the petrol dispensing pumps are machined from grey iron castings. Two castings

Fig. 8. Close-up view of the fixture on the Cincinnati milling machine, showing the locating and clamping units for the main pump bodies

at different stages in the machining sequence are seen in Fig. 6, and it will be noted that there are two rectangular feet which are face milled as seen at *A* on the casting at the left. Face milling is performed on six castings at a time on a Cincinnati Hydromatic duplex machine, and the machining operations which precede the milling stage have been completed on the casting at the right. These operations include machining of the main bore *B* for the pump rotor, and the adjacent face; boring a transverse hole—seen at *C* in the casting at the left—for a relief valve; pressing-in a bronze bush, at the same set-up on a turret lathe; counterboring the outer end of the hole; machining the surrounding face; and cutting a thread for a sealing cap.

Fig. 7 is a general view of the Cincinnati machine, which has a 42-in. long table, with a traverse of 36 in. under automatic control. The machine is arranged for climb milling and the two spindles are fitted with Escalloy cutters of 6 in. diameter, which have wedge-clamped, carbide-tipped, inserted teeth. Each cutter has 12 teeth, and the geometry of the cutting edges gives 15 deg. negative radial rake, 15 deg. positive axial rake, zero true rake, 45 deg. corner angle and 12 deg. positive angle of inclination. The cutters are run at 167 r.p.m., and the table is fed at a rate of 8 in. per min. for cutting, the thickness of metal removed ranging up to ¼ in.

A massively proportioned fixture is secured to the machine table, and accommodates six components in two rows. The fixture is arranged for hydraulic clamping, by PowRlock Junior units supplied by Spencer, Franklin, Ltd. (MACHINERY, 92/1178—16/5/58). At each end of the fixture base there are pairs of stout pillars, as at *D*, and on the pillars at the far end of the base (as viewed in Fig. 7) are pivoted two beams, one of which is indicated at *E*. A bridge member *F* is fitted to the nearer pair of pillars, and has a slot at each side with which a beam can be engaged. In the end of each beam is fitted a large diameter ball, as at *G*, which is urged outwards by a spring, but retained by a plate. When the beam is engaged with the slot in the bridge member, the ball enters a groove to retain it in position.

Each beam carries three clamping units, incorporating PowRlock heads as at *H*. The heads are connected by flexible hose to a manifold *J*, secured to the beam, and each takes the form of a hydraulic cylinder with a hollow ram, which has a bore of $\frac{3}{32}$ in. diameter. Pressure oil for the heads is supplied to each manifold from an air-hydraulic booster, as at *K*, by way of flexible tubing, and each booster is connected to the shop air supply by large-bore hose. The boosters are mounted on a cross-member that spans the columns of the machine, and this member also carries Norgren filter and lubricator units and a pressure reducing valve, also a Maxam lever-operated valve *L* for controlling the air supply to the boosters. With the pressure of the air supply to the boosters set at 40 lb. per sq. in., a force of 800 lb. is applied by each head, the maximum clamping stroke being $\frac{5}{16}$ in.

Details of the clamping and location arrangements for the workpieces are seen in the close-up view in Fig. 8. Each casting is clamped by a plate with three pads, and most of the plates are circular, as seen at *M*. The plate for the casting at the far end of each row (as viewed in Fig. 7 and 8) is cut away, and one of these plates is seen at *N*. A large V-shaped notch embraces the headstock casting at that side of the machine when the beam is swung outwards, and thus permits additional movement. The large flat at the other

side of the plate ensures that there is ample clearance for loading and unloading the workpieces. Each plate is fitted with a vertical pin which enters a hole in the beam and prevents rotation. The plates are mounted on universal swivelling joints at the ends of studs that pass through the PowRlock heads. Each stud extends through a hole in the beam into a counterbore, and is urged upwards by a compression spring which acts against the bottom of the counterbore and the lower face of a nut fitted to the upper end. The arrangement is such that when pressure oil is applied to the PowRlock head, the plate is thrust downwards, compressing the spring, and the latter lifts the plate when the oil supply is cut off. Each counterbore is closed by a small circular cover plate to prevent the ingress of swarf and dirt.

On the fixture base there are work-support blocks, each with a spigot, as at *P*, and a horizontal seating face. A casting is loaded so that the previously-machined rotor bore (*B*, Fig. 6) engages the spigot, and the face surrounding the bore rests on the seating. At one side of each support block, there is a vertical pillar with a knurled-head screw, the pillar for the block *P* being seen at *R*. In line with the screw, and secured to a facing on the fixture base, there is an L-shaped location block *S*. When a casting is loaded on to the support block, a special plug, fitted in the previously-machined relief-valve bore, extends over the block *S*, and pressure is applied to the casting by the knurled-head screw to swing the workpiece about the spigot *P* until the plug contacts the vertical limb of the block. The pump body is then located with the relief valve bore in line with the travel of the table, and the clamps are applied.

A locating plug is seen fitted to the casting at the right in Fig. 6, and it has a threaded portion which is a slack fit in the thread machined in the casting. Location is taken from the plain portion of the plug, indicated at *T*, and at the end of this portion there is an integral flange. The flange contacts the machined face at the outer end of the relief valve bore when the plug is fully screwed home, and ensures that the portion *T* is at 90 deg. to the face. Locating plugs are fitted to a batch of six castings, at a bench adjacent to the Cincinnati machine, while another batch is being milled.

It may be of interest to mention that when the full clamping load is applied to the six castings, the maximum deflection of the beams is 0·030 in. The floor-to-floor time now required for milling six main pump bodies is 21 min., as compared with 27 min. when the work was hand-clamped.

MILLING SLOTS IN ROTORS

Rotor bodies for the main pumps are made from cast iron, and each has six equally-spaced radial slots, which are 0·188/0·190 in. wide by 1⅛ in. deep. The slots are milled on an Archdale 18-in. production type machine, after the body has been turned, faced, and bored, and side-and-face cutters are used, each of which has 14 teeth tipped with Escalloy tungsten carbide. A close-up view of the set-up is given in Fig. 9, and the rotor bodies are milled four at a time, two being mounted on each spindle of a 2-spindle indexing fixture.

This fixture is of simple construction, the work-carrying spindles being carried in a block *U* at one end, which is integral with the base. Both spindles have gear teeth which mesh with an intermediate gear, so that they can be rotated together by means of a tommy-bar inserted in holes in the flange of either unit. Separate locating plungers are provided for each spindle, as seen at *V*, and engage bushed holes in the flanges. At the end of the fixture base remote from the block *U* there are lugs, between which is pivoted a bar *W*. This bar carries two retractable centre points, which are

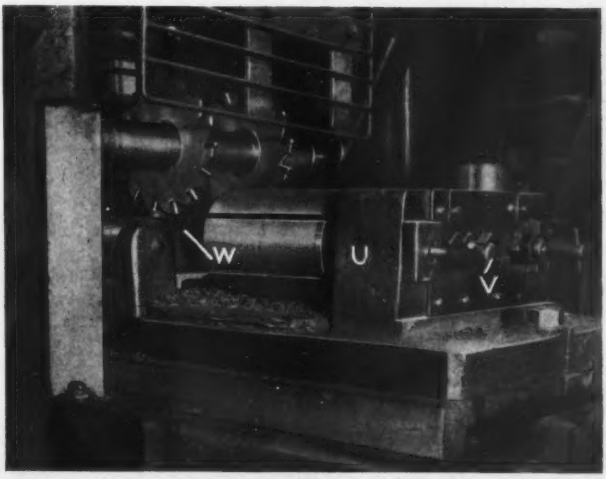


Fig. 9. At this set-up on an Archdale machine, six slots are milled in each of four main pump rotors at one setting. A 2-station indexing fixture and two carbide-tipped cutters are employed

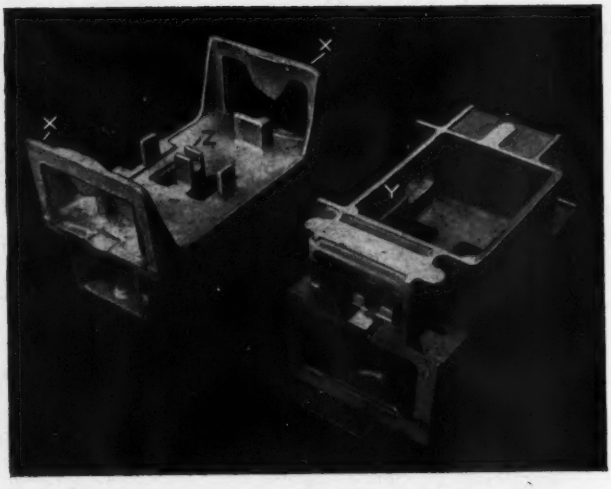


Fig. 10. An unmachined light-alloy casting for a component known as a clock case is seen at the left, and a casting which has been milled on the end faces, at the right

engaged with centre holes in the ends of the spindles, to support them during the milling operations. For loading, the centre points are withdrawn and the bar is swung upwards to afford access to the spindles. Two blanks are then loaded on each spindle and clamped by means of a nut and washer.

For the milling operations, the cutters are run at 150 r.p.m., and the table is advanced at a feed rate of 2½ in. per min. The time required for milling the six slots in four workpieces is 9 min., and 1,400 components can usually be milled before the cutters need to be resharpened.

MACHINING LIGHT ALLOY CASTINGS

Part of the mechanism for the petrol pumps is housed in an aluminium alloy casting, known as a clock case. An unmachined casting is seen at the left in Fig. 10, and it will be observed that it is of thin section, with numerous cored openings, so that special attention must be paid to supporting and clamping during machining operations. Particular care is necessary in connection with the milling of the end flanges *X*, and a casting is seen at the right after these flange faces have been machined.

The flange faces are milled simultaneously on an Archdale duplex machine, and a view of the set-up is given in Fig. 11. It should be mentioned that certain guards have been removed in order that details of the fixture and cutters may be more readily observed.

Before the milling operation on the Archdale machine, a facing inside the box portion of the casting is milled for location purposes, as indicated at *Y* in Fig. 10, and the bottom face of the box portion (seen uppermost on the part at the right) is also machined to ensure a good seating surface.

A fixture of welded construction is provided on the Archdale machine, and it has a beam, of inverted-U shape, pivoted in a block at one end. This beam is indicated at *A* in Fig. 11, and the end remote from the hinge is located by a slot in

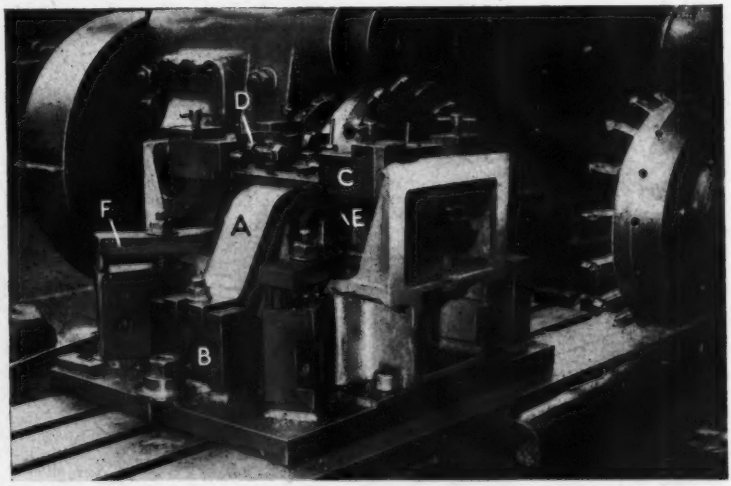


Fig. 11. A view showing the fixture and cutters designed and made by Vickers Armstrongs (Engineers), Ltd., for milling the end faces of "clock cases" on an Archdale duplex machine

a block *B*, on the fixture base, and secured by a nut and eye-bolt. On the beam is mounted a frame with blocks—as at *C*—at each corner. Each block houses a sliding plunger, which is urged outwards by a spring, and each plunger can be withdrawn into the associated block, and held in the withdrawn setting by turning it through 90 deg. The inner end of each plunger is fitted with a finger lever, and each block is provided with a thumb-screw whereby the plunger can be locked in place. At each side of the frame, between the blocks, there is a screw and lock nut, as at *D*. These screws serve to steady the casting during the milling operations.

The beam *A*, and with it the frame assembly, are swung clear for loading, and a casting is mounted in the fixture with the bottom face of the box portion resting on the base, as shown. The beam *A* is then swung into the working position, and is lightly secured by the eye bolt and nut of the block *B*. Below the beam there is a wedge shaped block *E*, which is engaged with the clevis member *Z*, Fig. 10, to locate the casting transversely. The casting is then thrust endwise by a hand-operated screw in the pivot block for the beam, so that the machined face *Y* contacts a location member on the base of the fixture.

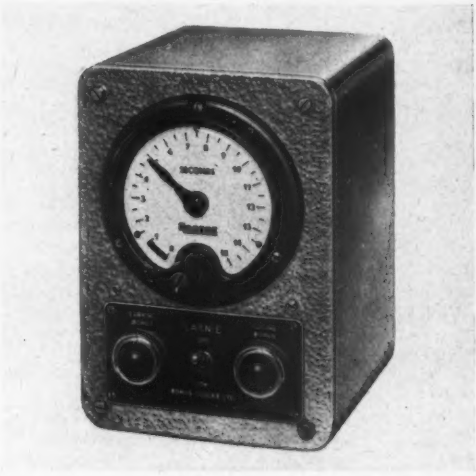
With the casting thus positioned, the beam is finally secured, and clamps, as at *F* in Fig. 11, are applied. These clamps, it may be noted, make contact with the casting immediately above the corners of the box portion to reduce the risk of distortion. The screws at each side of the frame are advanced into contact with the workpiece until they are "finger tight", and are locked in position. Finally, the levers of the spring plungers are moved to the vertical positions shown, so that the plungers are released, and urged into contact with the casting by the associated springs. These plungers serve as vibration dampers during cutting, and they are secured in their working settings by the thumb screws.

For the duplex facing milling operations, Vickers Armstrongs have made the special cutters seen in Fig. 11. Each has a steel body with angularly-disposed holes to receive 16 Escalloy carbide tipped boring tools, supplied by English Steel Tool Corporation, Ltd. Screws in the cutter body provide for adjusting the tool bits endwise and for clamping them in the seating holes, and the bits are set so that the points of the carbide tips are on a 10-in. diameter. The cutters are run at a speed of 365 r.p.m. for the face milling operation, and the work-table of the machine is traversed at a feed rate of 5 in. per min.

Another article on the production of petrol pumps will be published shortly in MACHINERY.

Simplified Bonus Clock

Bonus Clocks, Ltd., 5-7 Church Road, Richmond, Surrey, have now introduced a version of the Robinson "bonus clock" which is cheaper and



"Earnie" bonus clock, introduced by Bonus Clocks, Ltd.

simpler than that described in MACHINERY, 98/217—25/1/61. Known as "Earnie," this recording clock, which is of patented design, does not show the actual bonus time or cash earnings, but informs the operator immediately if a longer time is being taken over an operation than that for which the dial is set. A green lamp is illuminated during the period for which the clock is set, and a red lamp when this time has elapsed.

The standard bonus clock already described has a range of 15 sec.-10 min., but this modified type can be supplied with ranges of 3 to 15 sec., 15 sec. to 4 min., and 30 sec. to 12 min. A built-in electro-magnetic counter with hand re-set can be provided, and a floor stand is available. The cast aluminium housing of the clock measures 8 by 6 by 9 in., or 11 by 6 by 9 in., if a counter is built-in.

If it is considered undesirable for an operator to be able to alter the dial setting, the instrument can be supplied with a removable key in place of the knob. It has been found, however, that very good results have been obtained by allowing the operator to adjust the setting knob until the best working pace has been ascertained. Increases in output of between 20 and 40 per cent are stated to have resulted from this procedure.

Standardization of Machine Tools in East Germany

By R. E. GREEN, Associate Editor

REFERENCE TO THE ORGANIZATION and the scale of operation of the machine tool industry in East Germany was made in MACHINERY, 99/202—26/7/61, in an article primarily concerned with the Institute of Machine Tool Engineering in Karl-Marx-Stadt, and the work undertaken there. In this article, other activities of the Institute are considered, including the development of a system of unit construction for machine tools, and efforts to increase the productivity of the machine tool-using industries.

THE PRINCIPLE OF UNIT CONSTRUCTION

Attention was drawn in the previous article to the adoption of the so-called unit construction system by machine tool factories in East Germany. In this connection, much of the impetus has come from the Institute, where the system is seen as affording a further contribution towards the reduction of costs and the raising of efficiency within the industry. While the idea is by no means new, the use of standardized components for the construction of a range of equipment has been largely confined hitherto, in the Western countries, to the products of individual factories, and the results of the application of the system on a national basis will be awaited with interest.

One of the first machines to which unit construction principles were applied was the centre lathe, which is made in various types and sizes by a number of East German factories. Working in conjunction with the Institute, the designers of these companies have modified their machines so as to incorporate components and assemblies with standardized dimensions. The simplest application of the system is to a centre lathe made in only one size, which may be designed to incorporate, for instance, any of four headstocks, all of which have similar dimensions. These headstocks are so designed that the same casting can be employed for all, and the number of castings required makes it possible for larger batches to be handled on special equipment such as multi-way drilling and boring machines.

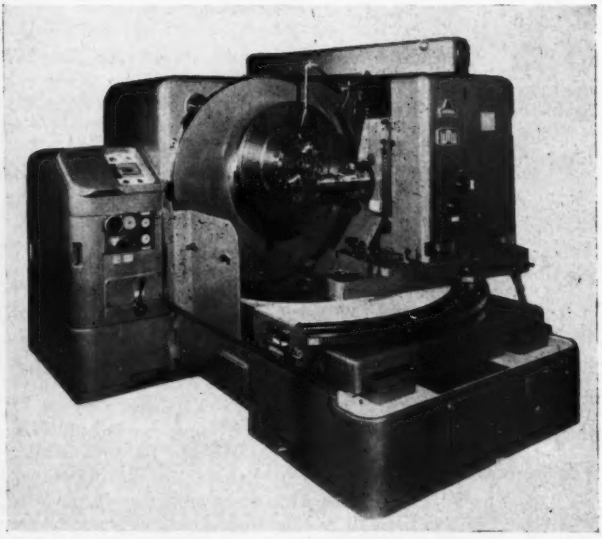


Fig. 1. This spiral bevel and hypoid gear generating machine, built by the Modul factory in Karl-Marx-Stadt, is designed for roughing operations, and is one of six machines in which the same basic elements are employed

On assembly, the headstocks may be fitted with gear arrangements to provide restricted, normal, or wide speed ranges, and with equipment for the selection of speeds by levers, magnetic clutches, or hydraulic cylinders under remote control, or with steplessly-variable speed drives. Similar arrangements may be made as regards feed gearboxes, which may incorporate only feed gears, or feed gears with provision for thread-cutting, and gear-changing by levers or under remote control. A range of interchangeable spindles, for use with various types of chucks, to be operated by pneumatic, hydraulic or

electric power, or by hand, may be provided, and the tailstock may also be arranged for hand or power operation.

The saddle is designed for use with a range of equipment including the normal cross-slide with compound rest, tool turrets with either vertical or horizontal axes, cutting-off tool-holders, and copying slides. With such a range of standardized units it is possible to build a wide variety of lathes, and standard or special machines can be provided at relatively low cost. Examples of lathes built from components or assemblies such as those mentioned were shown at the Leipzig Fair by the 8th May factory, and were described in MACHINERY, 98/939—26/4/61.

From the use of standardized parts for one size of machine, the next step is to re-design certain parts so that they can be incorporated in two or more different sizes. For instance, by slight increases in the dimensions, a lathe spindle suitable for a 6-in. swing lathe is used in an 8-in. version of the machine. The spindle is then somewhat heavier than is necessary for the smaller machine, but economies in production costs, and the possibilities of using auxiliary equipment such as chucks and the associated operating mechanisms on both sizes of lathe are expected to offset this drawback.

Another aspect of the unit system is the possibility of employing standardized sets of gears, made in a wide range of diameters and pitches, with splined bores of standard sizes. Such gears could be produced by the most efficient modern methods on production lines of the type employed in motor vehicle plants, and designers would be encouraged to incorporate them in all new designs of machine until they became fully integrated into machine tool building.

UNIT CONSTRUCTION OF GEAR-CUTTING MACHINES

Because the various types of bevel gears employed in such large numbers in the motor vehicle industry fall within a fairly narrow size range, only one size—or at most two sizes—of bevel gear cutting machine is built, although a variety of types is required to suit the cutting processes to be employed. The largest factory engaged in building gear cutting machines in East Germany is that of Modul, in Karl-Marx-Stadt, and the range of bevel gear cutting machines made by this company now includes six types, all of which incorporate standardized units. An example is the ZFTKKR 500 by 10, spiral bevel and hypoid gear generating machine, intended for roughing operations on gears up to 14 in. diameter, which is shown in Fig. 1.

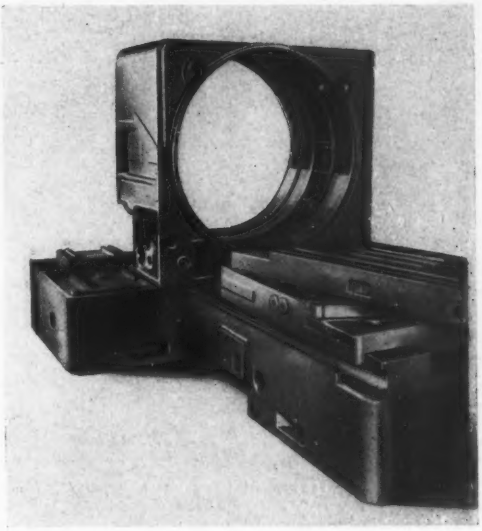


Fig. 2. The basic elements of the range of bevel gear-cutting machines made by Modul include the bed, drum housing, table, and a support beam (not shown)

An assembly of some of the standardized units employed in this range of gear-cutting machines is seen in Fig. 2, and it incorporates a base casting with machined surfaces on which housings for the various mechanisms are carried. The large housing at the rear has a circular aperture in which can be fitted spindle-carrying drums of five different types, depending on the design of machine required. To the left of this housing there are surfaces to carry the roll drive gearbox, which may also take several forms. The swivelling table, which is also standardized on all six machines, is carried on guide-ways in front of the large housing.

Several designs of work-spindle housing may be fitted to the table to suit the type of machine to be constructed and the completed assembly may incorporate equipment for hydraulic clamping of the work, stepless feed regulation, automatic changing of the feed rate for roughing and finishing passes, and an automatic chip conveyor in the base. The support beam fitted at the top of the machine in Fig. 1, between the cutter- and the work-spindle housings, is also standardised, and may be fitted to any machine on which it is required. Although the range of six machines must obviously include many special components and assemblies, it is evident that considerable economies may be expected to result from the ability to machine the

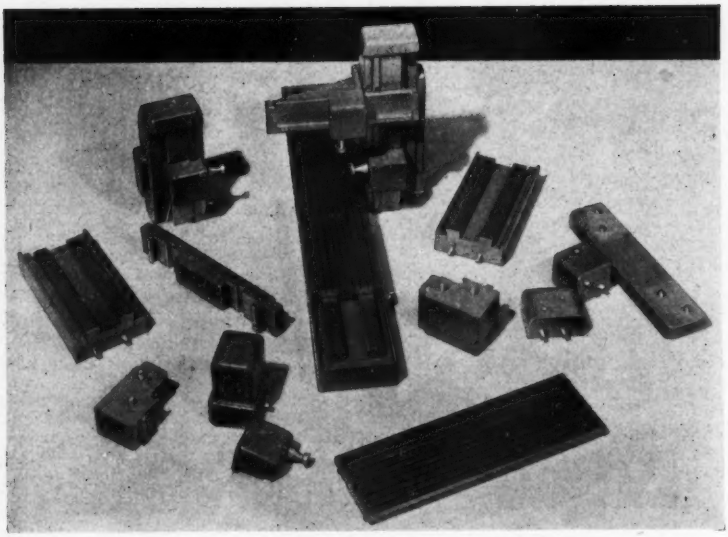


Fig. 3. These models show the basic elements and several of the common components and assemblies from which plano-milling machines of various types can be built up

heavier castings in batches of larger quantities.

The Modul factory has also applied the unit construction principle to the design of gear-shaping machines of two sizes, with capacities for gears of 9·8 and 19·68 in. diameter. It is calculated that the total cost savings likely to result from reductions in the time required for design, in foundry patterns, and in the time required for setting up for machining (because of the larger batches handled) will be of the order of 40 per cent. At present, however, the pressure of work in the Modul factory, and in other machine tool plants where unit construction methods are employed, is so great that there has been little opportunity for building the special machines and fixtures required to enable full advantage to be taken of the system.

Plano-milling and planing machines also lend themselves well to construction from basic units, which include the bed, right- and left-hand columns, cross-beam and cross-rail, and cantilever cross-rail. These basic units, examples of which are shown in model form in Fig. 3, are used in conjunction with other components and assemblies such as tables, table-drives, right- and left-hand milling spindle heads or cross-slides, and slide adjustment drives. When automatic operation of such a machine is required, extra—specially-designed—equipment is added to the standard assembly.

As mentioned in MACHINERY, 98/1077—10/5/61, the Naumburg factory has recently introduced a range of standard units from which a variety of vertical honing machines can be assembled for specific purposes. The range of basic units includes bases, columns, rectangular and circular tables in several alternative sizes, and single- and twin-spindle heads, and the machines can be fitted with equipment that provides for either semi-automatic or fully-automatic control.

UNIT SPINDLE HEADS

To enable automatic transfer machines of the in-line and rotary types, also multi-way drilling and tapping machines to be built economically, a range of unit spindle heads and associated bed, column and table units, feed slides and other equipment, has been introduced, which provides for such operations as multi-spindle drilling and tapping, boring, fine-boring, milling and face-grinding. These heads have been designed in collaboration with the Institute by the John Schehr factory in Leipzig, where milling and plano-milling machines and milling heads are made; by the Saalfeld drilling machine factory; by the Vogtland factory at Plauen which supplies a complete range of heads in a variety of sizes; and by the Mikromat factory in Dresden where grinding heads are produced.

The travelling-type milling head seen in the background in Fig. 4 is from the Vogtland range, and was exhibited at the Leipzig Fair, together with the model of an in-line transfer machine in the foreground. Of conventional design, the milling head can be supplied with a single spindle speed, to suit the application, and a single feed rate. Control equipment is also available whereby the head can be arranged to operate on a rapid advance, machining feed, and rapid return cycle, which can be synchronized in the automatic cycle of the complete machine.

Unit boring heads, from the Vogtland range, are incorporated in the 3-way boring and facing machine in Fig. 5, which was designed for opera-

tions on three slightly different iron castings for lorry gearboxes. These heads have facing slides which are operated through helical rack and pinion systems powered by hydraulic cylinders, as seen at the right-hand end. The small electric motor above the cylinder provides for small increments of movement at slow speeds when setting-up.

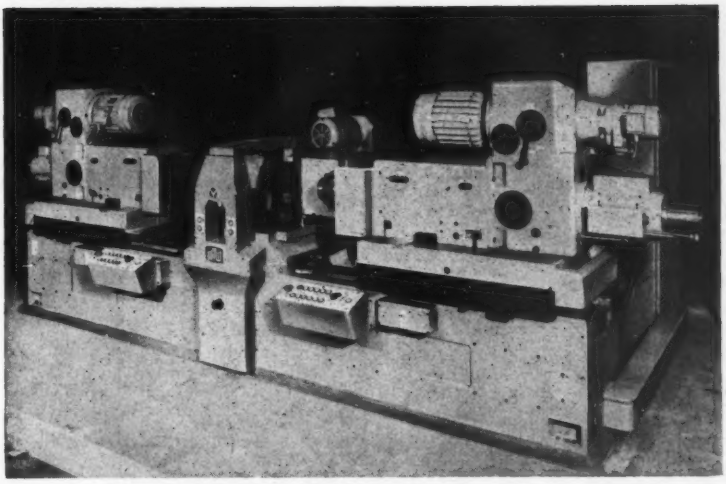


Fig. 5. Standard fine-boring heads, with equipment which includes radially-fed facing slides operated by hydraulic cylinders, are incorporated in this 3-way machine for operations on gearbox castings

EQUIPMENT FOR LINKED MACHINE LINES

As mentioned briefly in MACHINERY, 98/1075—10/5/61, equipment has been developed by the Institute, in collaboration with several factories, whereby a number of different machines, each working on an automatic cycle, can be arranged for automatic loading and unloading. Examples of such equipment have already been described, notably in connection with a link-line for the production of electric motor shafts (MACHINERY, 95/213—12/8/59). Since that article was published, the line has been installed in a factory at Niedersedlitz, where it has been supplemented by equipment designed to roll serrations on the shaft periphery to retain the armature, and to press the armature into position.

Fig. 4. Typical of the range of milling units available is this AF 3 travelling type head, suitable for use in in-line transfer machines such as that seen in model form in the foreground

Equipment needed for such a line includes conveyors to carry the work from the unloading position of one machine to the loading position of the next, and an automatic unit which has been designed by the Institute for this purpose is shown in Fig. 6. This particular unit is arranged for handling shafts, which are transferred from a position at the left by a double roller-chain conveyor, provided with V-blocks. The conveyor is indexed

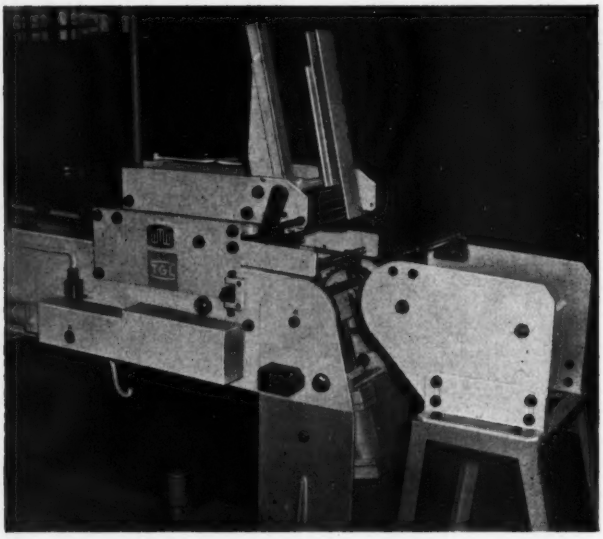


Fig. 6. Developed by the Machine Tool Institute, this unit forms part of a complete standardized system designed for linking automatic-cycle machine tools to provide fully-automatic production lines

automatically, by successive movements of an air cylinder ram, and shafts are thus brought, in turn, into a position above two other V-blocks on the ends of a horizontal bar.

The bar is attached to the ram of an inclined air cylinder, and when this cylinder is operated, the shaft is raised into the guide-ways of a nearly-vertical magazine above. Spring-loaded retainers hold the shaft when the cylinder ram is retracted, and the magazine is arranged to hold a number of shafts to provide a buffer stock. When the next machine in the line completes a cycle and calls for another shaft, a third air cylinder is operated, to push the magazine to the right, horizontally, towards the loading station of that machine. In Fig. 6, this station is represented by the small unit at the right, which carries two more V-blocks, each having a sloping surface on one side.

As the magazine is advanced, the lowest shaft in the chutes rides up these sloping surfaces and then descends into the V-grooves, in which it is retained when the magazine is retracted. The transfer equipment of the next machine is then brought into operation to carry the shaft to the chucking or clamping position.

SPECIAL TOOLS

Engineers of the Institute have also carried out investigations in connection with tools of the type employed for machining multi-diameter bores, and some standard designs in which the cutters can be adjusted to various positions in both the axial and radial directions have been developed. Much of this work has been concerned with tools which enable roughing, semi-finishing, and finishing operations to be carried out at a single pass, and an example is shown in Fig. 7.

The drill illustrated has separate lands of two different diameters, which serve to drill the hole from the solid and take a semi-finishing cut. Further advance of the drill then brings into operation a solid carbide blade *A*, which is clamped in a slot in the tool shank. The blade can be arranged to cut on one or both edges, and if only one edge is used, provision can be made for taking up wear, also for compensating for metal removed in regrinding, by means of a back-up or rubbing pad on the side opposite to the blade. Experiments have shown that holes with a finish of 40 micro-inches can be produced consistently, over long periods, with such a tool.

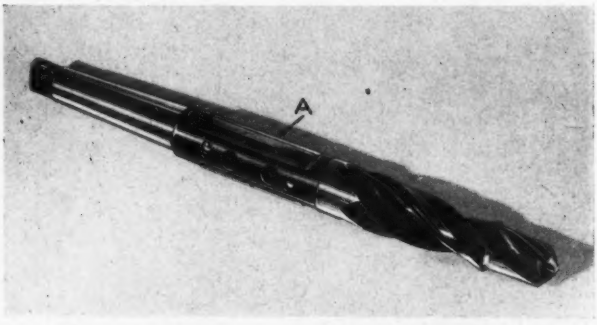


Fig. 7. Work undertaken by the Institute includes the development of tooling of various types. This combination drill is fitted with a blade *A*, of solid tungsten carbide, which provides for reaming, after the hole has been drilled in two stages

Pinch Trimming and Swaging Dies for Covers

By M. J. GOLDSTEIN

SHOWN BELOW in Fig. 1 are the stages involved in the production of the jar cover *A* from 0·020 in. thick mild steel sheet. The blank size for this component is 3¾ in. diameter, and the press tool for the first operation produces the drawn, trimmed, and pierced shell at *B*. A feature of this tool is that it is arranged to pinch trim the component, to avoid the need for a separate trimming operation. The scrap produced by pinch trimming is indicated at *C*.

As may be seen in the drawing, Fig. 2, the construction, in general, follows normal practice for blanking and drawing tools, but the punch over which the blank is drawn consists of two members, *D* and *E*. The part *E* is curved to produce the required form on the component, and it incorporates a die insert for the pierced, $\frac{3}{16}$-in. diameter, hole in the top of the workpiece. The recess in the top of the part *D* is made $\frac{1}{16}$ in. deeper than the length of the shoulder on the member *E*, to allow for regrinding the trimming edge at *F*.

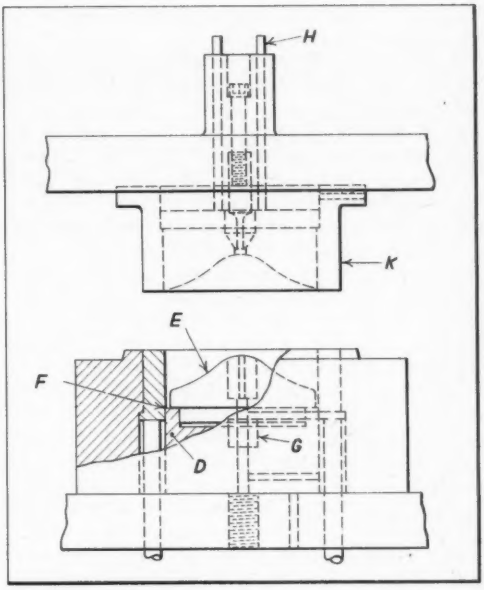


Fig. 2. Part-sectional view of the blanking, forming and pinch-trimming tool for the mild steel jar cover *A*, Fig. 1

A bush *G* is provided in the member *D*, which makes contact with the lower face of the part *E*, to prevent the $\frac{3}{16}$-in. diameter scrap piercings from the centre hole becoming jammed in the $\frac{1}{16}$-in. clearance space, When the pinch trimming surface is reground, the same amount is removed from the top face of the bush *G*. The punch for the centre hole has a ½-in. diameter shank and is held in the top tool by means of a socket-head screw. Two knock-out pins are provided at *H*, and both the blanking punch *K* and the die member *D* have

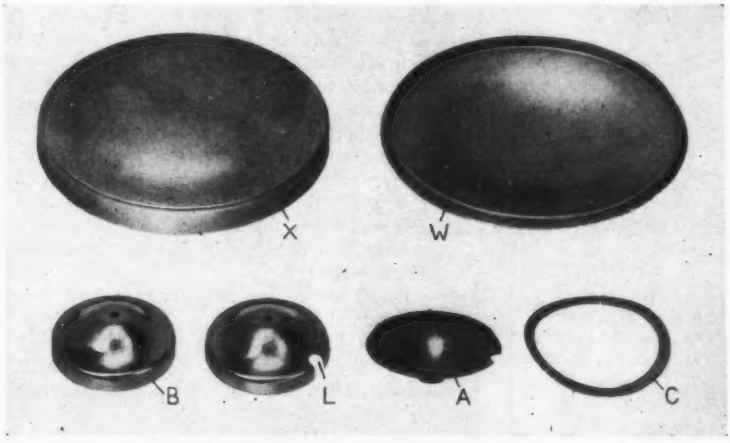


Fig. 1. Production stages for a casserole cover *W*, and a jar cover *A*. Blanking, drawing and pinch-trimming and rim swaging tools are employed

drilled air vents. Air vents are also provided in the member *E* to assist stripping.

A slot is required in the cover, as shown at *L* in Fig. 1, to accommodate a spoon, and is produced with the tool shown in Fig. 3. Here, the workpiece is located on the profiled steel block *M*, by means of a pin which engages the $\frac{3}{16}$-in. diameter centre hole. In making this tool, a turned, 1½-in. diameter shank was first provided on the block *M*, and a slot was milled to accommodate a cast-steel insert *N*. With the latter fixed in position, the block was finish machined on the profile, and the centre hole drilled and reamed for the location pin. Finally, the block was milled to an angle of 45 deg., for mounting on the bolster plate. After the required profile had been machined in the die insert *N*, and a clearance hole provided in the block *M*, the rough-machined punch *P* was finished by shearing it in the die opening, and removing excess metal by filing. It will be noted that the punch is provided with a heel which enters the die aperture before cutting starts, to prevent deflection.

The swaging operation, to bring the component to the stage seen at *A*, in Fig. 1, is performed in the tool shown in Fig. 4. Since no cutting is involved, pillars are not provided for this die set. The die ring *R*, of oil-hardened tool steel, has a recess of the same bore as the outside diameter of the component. The depth of this recess is ⅛ in., which is the same as the length of the shoulder required on the component after it has been swaged. The formed centre member *S*, which is provided with a location pin for the work, is a sliding fit in the die ring *R*, and is supported by four pressure pins *T*. The latter bear on the steel top washer of a rubber pressure pad carried on a ⅜-in. diameter rod screwed into a tapped hole in the bolster. The height of the pressure pins is such that when the workpiece is placed in position on the centre member *S*, the lower edge of the piece rests on the bottom of the recess. Thus, when the punch *U* moves down and makes contact with the work, the excess metal can only move outwards and form the required swage shoulder. A vent hole *V* is provided in the ring member to prevent air lock.

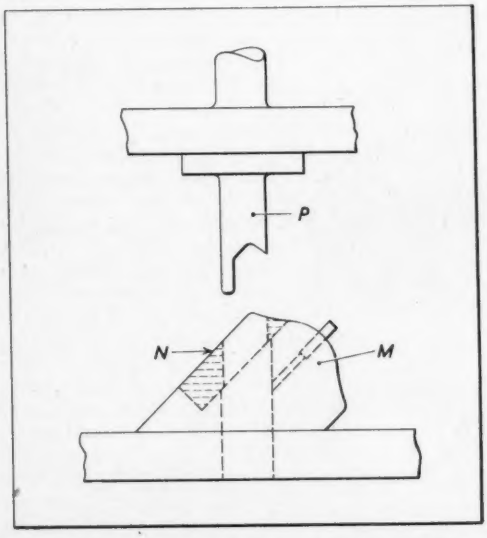


Fig. 3. Press tool for cutting the spoon slot in the jar cover

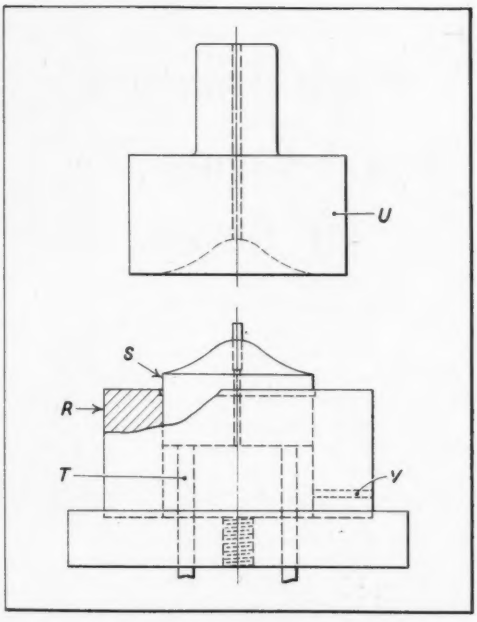


Fig. 4. Press tool for producing the swaged rim on the jar cover

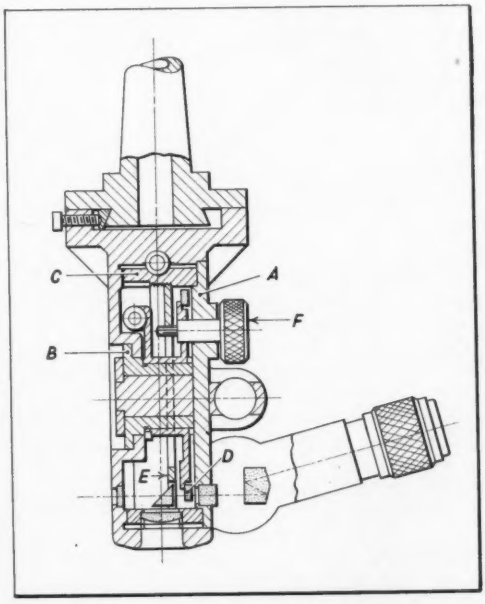
A somewhat similar component, but of larger size, is shown at *W* in Fig. 1. This casserole cover is made of 0·020-in. thick brass sheet, the blank size being 8½ in. diameter. The part is brought to the form shown at *X* in a tool of similar design to that employed for the cover *B*, the amount trimmed off by the pinch action being about ¼ in. The swaging tool is also of similar design to that shown in Fig. 4.

Machine Shop Patents

OPTICAL INSTRUMENT FOR MEASURING ANGULAR SETTINGS

Intended for accurate measurement of angular settings of the swivelling head on a vertical milling machine, the instrument shown sectioned in the accompanying side elevation has a taper spigot, whereby it may be mounted on the nose of the spindle.

The entire instrument is thus inclined when the head is swivelled, and the disc *A*, which is co-axial with a pin that is pivotally-mounted in the fixed bush *B*, is then turned back to a datum position. This position is obtained by reference to a bubble level, which is secured to the outer face of the disc, and the motion is imparted by means of a worm, which engages teeth on the periphery of the driving ring *C*, attached to the rear of the disc. Measurement of the angle through which the disc has been turned is obtained with the aid of a microscope, mounted on the disc, whereby markings on the glass scale ring *D* are observed through a graticule which is graduated in divisions of 1 min. of arc. The scale ring *D* is supported by a flanged plate, which is pivotally-mounted on the periphery of the bush *B*, and is normally held stationary in relation to the case. To provide for adjustment of the zero position, however, the assembly may be turned by means of worm screws.



Sectional view of an optical instrument for measuring angular settings of a swivel-type vertical milling head

To facilitate reading, the scale ring is illuminated by light which passes through an arcuate slot in the rear of the case, and then through a window in the ring *E*, which is screwed into the driving ring *C*. When the instrument is being set up, the ring *E* is turned independently to a second position, motion being transmitted from the operating knob *F* by a shaft that extends through an arcuate slot in the scale ring carrier and has a pinion which meshes with teeth in the bore of the ring. In this way, a prism mounted on the ring is brought into line with the optical axis of the microscope, as shown in the drawing, to permit observation directly below the instrument, through a magnifying lens, housed in the driving ring. By turning the instrument about the vertical axis, it is adjusted to a position such that diametrically-opposed pairs of lines on the microscope graticule straddle the image of any transverse edge on the machine, to ensure that the plane of the scale ring is parallel to that in which the spindle head swivels. Clamping screws, whereby the instrument is secured to the taper spigot, provide for horizontal adjustment, for aligning the axes of the vertical optical system and the spindle.

864,575. Karl Miller, 6 Kochstrasse, Innsbruck, Austria. *[Application date in Austria May 6, 1958. Published April 6, 1961.]*

FEED MECHANISM FOR A TAPPING MACHINE

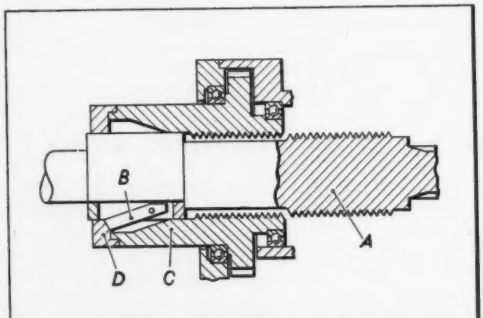
The arrangement here described is intended primarily for incorporation in the feed mechanism of a tapping machine of the type whereby the feed and return movements of the spindle are obtained as a result of the engagement of a threaded portion with a nut, the spindle being rotated at faster and slower speeds, respectively, than that at which the nut is constantly driven. It serves to ensure that axial movement to bring the threaded portions together at the beginning of an

operating cycle is not imparted until the first threads on the spindle and nut are in such angular positions that they will engage smoothly.

In the accompanying sectional view, which shows part of the mechanism within the spindle head, the spindle *A* is shown in the position which is occupied after the completion of an operating cycle. A pawl *B*, which is pivoted in a longitudinal slot in the spindle, is enclosed within an annular extension at the left-hand end on the feed nut *C*. During the idle period after the completion of a cycle, the spindle is rotated at the speed employed for the feed stroke, and the pawl is thus held outwards by centrifugal force. When a fresh cycle is started by means of a cam-operated lever, the spindle is traversed to the left until the pawl contacts the inner face of a ring *D*, which is attached to the outer end of the feed nut extension. Additional movement of the lever then serves to compress a spring which urges the spindle in the same direction.

The inner face of the ring is bevelled, and over an arc of 180 deg. the angle of inclination is such that the line of the force resulting from the spring pressure passes through the pawl pivot, the assembly thus being held stable to prevent axial movement of the spindle. Rotation of the spindle with respect to the nut subsequently brings the pawl into contact with a different portion of the bevel, which is at such an angle that the line of force passes between the pivot and the spindle axis. The pawl is then thrust into the slot, and the spindle is allowed to move to the left, under the spring pressure, in a pre-determined angular relationship with the nut.

The operating lever is returned while the tapping cycle is in progress. A second spring serves to move the spindle clear of the nut, during the final stage of the retraction stroke, after the threads have disengaged.

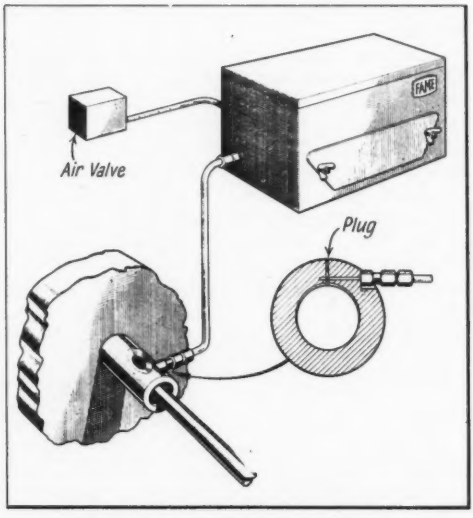


Feed mechanism for a tapping machine designed to ensure smooth engagement of a thread on the spindle and a rotating nut

854,533. Wickman, Ltd., Banner Lane, Tile Hill, Coventry. (Inventors, Mr. R. J. Dixon and Mr. L. Jones.) *[Application date, March 25, 1958. Published, November 23, 1960.]*

Fame Automatic Lubricant Injector

The Foundry & Metallurgical Equipment Co., Ltd., Netherby, Queen's Road, Weybridge, Surrey,



The Fame automatic lubricant injector

are producing the Fame automatic lubricant injector for applying graphite compounds and other suitable lubricants to the surfaces of mating plungers and sleeves in pressure die casting machines. This equipment, which is shown in simplified form in the accompanying figure, comprises a supply tank and a 2-stage air-operated pump designed to deliver metered quantities of lubricant at a final pressure of 1,500 lb. per sq. in. to a connector screwed into the sleeve of the die casting machine. Pump displacement is controlled by steel distance pieces which may be set to control the delivery of lubricant at each stroke from a minimum of 0·005 cu. in. to a maximum of 0.045 cu. in. The equipment is operated by compressed air at 60-150 lb. per sq. in., and may be controlled by an air valve arranged for solenoid or mechanical actuation.

NEW PRODUCTION EQUIPMENT

Edited by
G. W. Mason
and
A. J. Barker

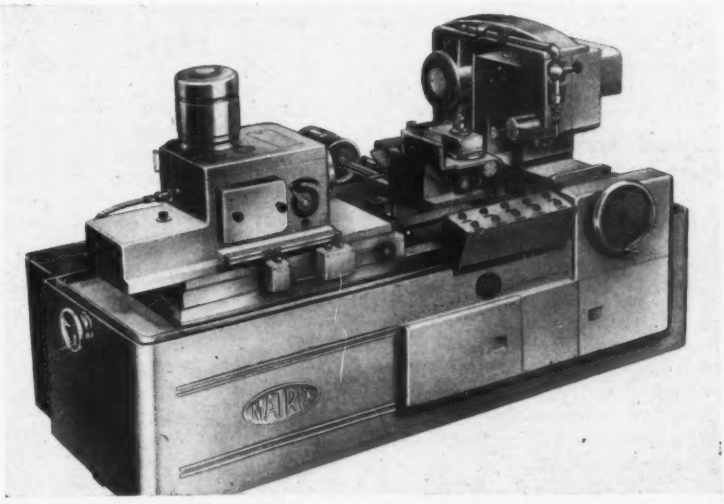
Matrix Type TI 1315 Internal Thread Grinder

The Matrix type TI 1315 machine shown in the illustration, has recently been introduced by the Coventry Gauge & Tool Co., Ltd., Fletchamstead Highway, Coventry, for performing internal thread grinding operations on nuts of the ball-circulating type, also nuts and half-nuts with various thread forms.

Workpieces up to 13 in. diameter can be handled on the machine, and right- and left-hand threads up to 10 in. diameter, with helix angles up to 15 deg., can be ground for a maximum length of 5 in. If required, a special wheel-head can be fitted which enables threads with helix angles up to 10 deg. to be ground for a maximum length of 7 in. Apart from loading and unloading of workpieces, the machine is fully automatic in operation, and can be set for taking a single cut, or a number of cuts up to a maximum of 24 during the cycle. Grinding is carried out with a single-rib wheel of 3 in. maximum diameter, which is automatically dressed at pre-set intervals. When a number of cuts is to be taken on the work, wheel dressing can be carried out at the beginning or the end of the final pass.

For grinding nuts of full circular cross section, an increment of in-feed is automatically applied to the wheel-head at each reversal of the work-head slide, and the maximum feed movement obtainable is ¼ in. When a half-nut is to be ground, in-feed is applied before the work-spindle is started, for grinding the thread to a pre-set depth at a single pass. Drive to the spindle is then engaged, and at the end of the grinding stroke, the wheel-head is moved clear, and the spindle is reversed to return the work-head slide to the starting position. When a thread grinding operation has been completed, and for wheel dressing, the wheel-head is withdrawn to its rear-most position by compressed air. Following a dressing operation, the wheel-head is adjusted, the motion again being imparted pneumatically, to compensate for reduction in wheel diameter. The wheel-head and the diamond wheel-dressing attachment can be tilted to each side of the horizontal position for setting to suit the helix angle of the thread to be ground.

Grinding spindle units of two different types are available, one of which is driven by a belt from a 5-h.p. motor, and can be run at speeds of 15,000 and 18,000 r.p.m. The other unit is driven by a high-frequency motor, and the steplessly-variable spindle speeds obtainable range from 12,500 to 40,000 r.p.m.



Matrix type TI 1315 internal thread grinder with guards removed

Drive to the work-head is taken from a 2-speed motor of 1½/3 h.p., and 14 spindle speeds from 6 to 210 r.p.m. are available. From the spindle, drive for traversing the work-head is taken by a lead bar and nut. Interchangeable lead bars and nuts are available to cover various thread pitches, and the same bar and nut are employed for grinding right- and left-hand threads of the same pitch. The work speed is normally the same for the grinding and return travels of the work-head slide. When very low speeds are employed for grinding certain workpieces, however, a spindle speed of 56 r.p.m. can be engaged to give a faster return travel.

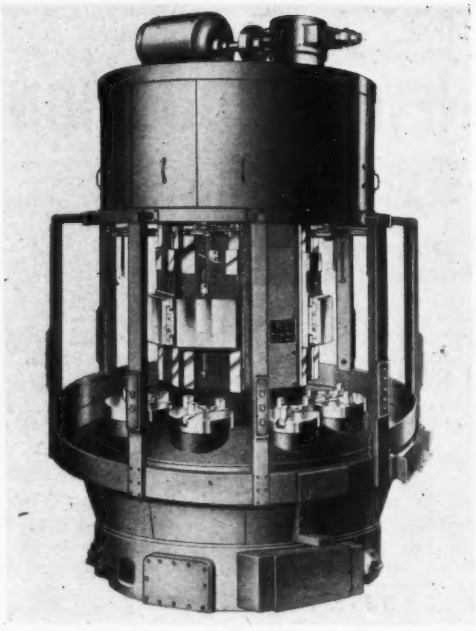
Bored 2 in. diameter, the work-head spindle can be indexed for grinding threads with different numbers of starts from 2 to 6. Adjustment is provided for controlling the ground threads for parallelism, also for bringing pre-machined threads in the work into engagement with the grinding wheel. The work-head slides on a base guideway, which can be adjusted on the bedways to suit the length of the component to be ground. A maximum distance of 15½ in. can be obtained between the nose end of the work-head spindle and the grinding wheel.

Coolant is delivered to the work through the spindle bore, also through separate pipes to the grinding wheel. Another pipe is fitted for delivering coolant to the wheel dressing attachment. A fume extractor system is provided, and the entire working area is normally enclosed by a guard. There is a hinged window in the guard, which can be swung upwards to the open position to give access to the work for loading and unloading.

Rockwell Machine Tool Co., Ltd., Welsh Harp, Edgware Road, London, N.W.2, are the sole selling agents for Matrix thread grinders.

Bullard Type M Mult-Au-Matic Vertical Chucking Lathe

Introduced recently by the Bullard Co., Bridgeport, Conn., U.S.A., for whom the agents in this country are Buck & Hickman, Ltd., Otterspool Way, Watford By-Pass, Watford, Herts., the type M Mult-Au-Matic vertical chucking automatic, here shown, is available with 6, 8, or 12 spindles. With the latter arrangement, there are two spindles at each station, to enable two series of machining operations to be performed simultaneously. On the other machines, there is normally one spindle at each position, but equipment can be incorporated for double indexing, if required. A maximum of 17½, 17¼, or 11⅞ in. diameter can be swung, depending on the number of spindles, and on the 6-spindle machine, this capacity normally covers a distance of 8¾ in. from the noses of the spindles, with provision for swinging 10 in. diameter over a further 6 in. of height. An extended central column can, however, be incorporated, to increase the height capacity for 17½ in. diameter. The machine is designed to enable modern cutting tool materials to be used to full advantage, and drive is taken from a motor of a maximum of 60 h.p., through a hydraulically-operated clutch and brake system of new design, wherein compensation is automatically provided for wear.



Bullard type M Mult-Au-Matic vertical chucking automatic

The spindle carrier is mounted on a long taper bearing at the lower end of the column, which is secured to a single-piece base casting, and the weight and downward thrust are taken by an adjustable ball bearing. Each spindle runs in three anti-friction bearings, and a total of 41 speeds, from 45 to 400 r.p.m., is obtainable, individually, for each working station, by means of change gears. Two- or three-jaw chucks, of 10, 12, or 15 in. diameter, can be mounted on the 8-in. diameter noses of the spindles, which are of the American standard A-1 form, and may be of the lever- or wrench-operated type. Equipment can be incorporated for power operation of the chucks,

with provision for adjusting the gripping pressure.

Feed is applied by a cam system to the tool slides, which are mounted in hardened and ground ways on the column faces, and change gears enable a total of 82 rates, from 0·0024 to 0·1872 in. per rev., to be obtained individually for each of the spindle stations.

A range of heavy-duty tool heads is available, with a maximum working travel of 8 in., and for one unit, which has a single slide, this movement is in the vertical direction only. Single slides are also incorporated in the plain compound and the universal units, and the working travel may be entirely vertical or may include a movement up to 4 in., in either direction horizontally with the former, and in any horizontal or angular direction with the latter.

Two slides are incorporated in the double-purpose unit, one of which provides for a maximum vertical travel of 3 in. The other slide is simultaneously moved horizontally, and feed rates in the ratios 1:1, 4:3, 2:1, and 3:1, also change of direction, can be obtained by interchanging gear brackets, without the need for removing the unit from the machine. Auxiliary heads which can be supplied include single- and multi-spindle drilling and tapping units, also units for internal and external spherical turning.

Coolant equipment can be provided, and the machine, which weighs approximately 11½ tons, occupies a floor space of 8 ft. 4 in. diameter.

Geargrind CGG—16 x 18FA Automatic Grinding Machine for Crowned Gear Couplings

The CGG −16 × 18FA grinding machine shown in the figure has been introduced recently by the Gear Grinding Division, Michigan Tool Co., Detroit, Mich., U.S.A., and is primarily intended for finishing the teeth on spherical gear-type couplings to a crowned form, although it may be employed for operations on spur gears and splined shafts, also for relieving the ends of teeth of plain spur gears. Numbers of teeth ranging from 3 to 220, of 64 to 4 d.p., can be ground to a maximum crown radius of 12 in. on gears with diameters up to 10 in. over the crests of the teeth and down to ¾ in. at the roots, and the maximum length of cut which can be obtained is 10 in. Up to 17½ in. diameter can be swung, and workpieces which have lengths ranging up to 18 in. can be accommodated between the centres.

When finishing crowned gears, an oscillating motion is applied, for a maximum angle of 45 deg. on either side of a central position, and with this arrangement, the crown radius is unaffected by the diameter of the grinding wheel. The machine may be operated under manual control, or on a semi-automatic or an automatic cycle, and with the latter, each tooth on the workpiece is rough-ground in a pre-determined number of passes, an increment of down-feed being applied to the wheel-head at each reversal of the work-table. After the completion of grinding at one position, the wheel-head is raised and the workpiece is indexed through one tooth space, in readiness for the sequence to be repeated, and when a pre-selected number of teeth has been ground, the wheel is automatically dressed.

During the dressing operation, an increment of down-feed is applied, to compensate for the amount which is to be removed from the wheel, and the diamond dressing unit is then traversed hydraulically across the face under the control of a template, to produce the required profile shape. Dressing is again performed after the rough grinding stage has been completed, and the teeth are then finish-ground in successive passes, and, finally, the machine is stopped.

Wheels from 3 to 6 in. diameter can be mounted on the grinding head spindle, which runs in pre-loaded ball bearings and is driven directly by a

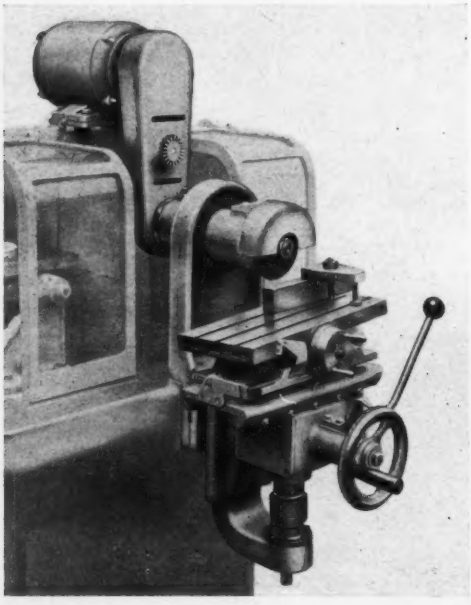
Geargrind CGG—16 × 18FA automatic grinding machine for crowned gears

2-h.p. motor. During grinding, coolant is delivered to the workpiece through the wheel. Vertical movement of the head through a maximum distance of 13½ in. is obtained hydraulically, and the total feed travel can be applied in any predetermined number of steps. The work-table has a maximum traverse of 32 in., and up to 116, 98, and 88 cuts per min. can be taken, when grinding gears with face widths of 2, 3, and 4 in., respectively.

The Michigan Tool Co. are represented in this country by Ex-Cell-O Group Sales, Ltd., Halford House, Charles Street, Leicester.

Beacon Chip-breaker Groove Grinding Attachment

An attachment for grinding chip-breaker grooves in turning tools has recently been introduced for use with the "Superior" type CT 8 grinding and lapping machine for tungsten carbide cutting tools built by Beacon Machine Tools, Ltd., Hurst Lane, Tipton, Staffs. This attachment is shown in the accompanying illustration, and details of the type CT 8 grinder were given in MACHINERY, 93/899—15/10/58.



The new attachment for grinding chip-breaker grooves in turning tools is here shown mounted on the Beacon "Superior" type CT 8 machine

Cutting tools up to 2 in. thick can be handled with the attachment, and the 12- by 6-in. work-table can be tilted through a maximum angle of 5 deg. to the left and right and towards and away from the column which carries the grinding spindle. It has a maximum adjustment of 2 in. on transverse guideways by means of a handwheel, and smooth movements in the longitudinal direction over stroke lengths up to 3 in. are provided by a ball-ended lever. The knee which carries the table assembly has a vertical adjustment of 2¼ in. by a large-diameter handwheel through bevel gears and a screw. Graduations are provided round the periphery of the handwheel for vertical adjustment, which give readings to 0·00025 in., and the spindles for the bevel gears are fitted with ball thrust bearings, and can be adjusted to eliminate backlash. The traversing screws for the vertical and transverse movements engage with renewable phosphor bronze nuts, and the guideways are fitted with gib pieces to permit adjustment for wear.

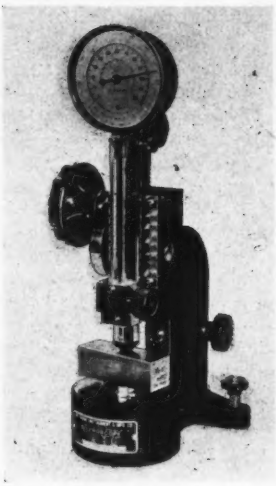
Mounted in Timken precision taper roller bearing, the spindle will take a 4-in. diameter by ⅛-in. wide diamond-impregnated grinding wheel, and is driven at a speed of 4,700 r.p.m. by a flat belt from a ½-h.p. totally-enclosed motor. The attachment weighs approximately 1½ cwt.

New Shore Scleroscope Hardness Testers

The Shore Instrument & Mfg. Co., New York, U.S.A., have recently introduced two new Scleroscope hardness testers known as the types C.2., and D. Stated to be very simple to use, the C.2. Scleroscope is an improved, direct-reading instrument, which is suitable for testing thin metal sheets, for example, of hardened steel from 0·006 in. thick and of cold-rolled, unannealed, brass and steel from 0·010 in. thick, also annealed sheets from 0·015 in. thick. It can also be employed for testing machined parts such as chilled iron and forged steel rolls, gears, and shafts.

An advantage of the instrument, for production purposes, particularly where highly finished surfaces are concerned, is that the diamond hammer leaves no impression visible to the naked eye, even on strip with a mirror finish. The instrument may be used "freehand," so that inspection can be carried out anywhere along a production line, and on components in position on machine tools and presses. Alternatively, it can be mounted on a stand or in a swing arm clamp on a test bench. A conversion table to Brinell and Rockwell C scales is available.

With the type D Scleroscope, which is shown in the accompanying illustration, the hardness number is read by means of a dial and pointer,



The Shore Model D Scleroscope hardness tester

instead of on a vertical scale behind the hammer tube. The scale is also graduated in Brinell and Rockwell C hardness numbers. This instrument will test all materials for which the type C.2. is suitable, but is not recommended for use freehand. A selection of clamping devices is available.

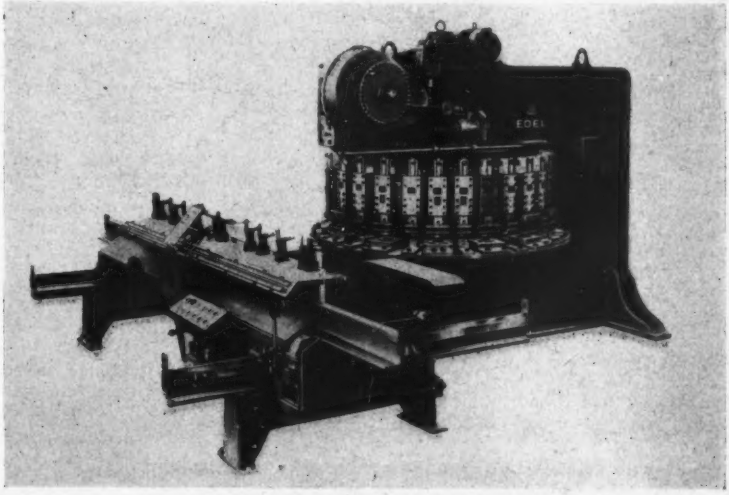
The sole agents for these Shore instruments in the United Kingdom and the Commonwealth, except Australia, are Griffin & George (Sales), Ltd., Ealing Road, Alperton, Middlesex.

Edel Turret Presses with Co-ordinate Tables

To facilitate the production of workpieces with large numbers of holes, such as the chassis for electrical equipment, turret presses in the German-built Edel range, which is marketed in the United Kingdom by F. J. Edwards, Ltd., 359-361 Euston Road, London, N.W.1, can now be supplied with co-ordinate setting work-tables. The robust, well-balanced table of each of these units can be traversed from left to right, and vice versa, on a single upper guide rail, and the entire assembly can be moved towards and away from the press on twin lower guides, as shown in the figure. Multiple stop members can be provided to facilitate positioning when repetition work is being performed. Operating controls are conveniently placed at the front of the unit.

Edel turret presses can also be equipped with template tables and other positioning arrangements, and are available with capacities up to 100 tons, throat depths up to 31 in., and numbers of punching stations between 12 and 40. If desired, alterations can be made to the standard design, to suit individual requirements. The turret of each machine can be indexed in either direction, and after completion of the movement, is located accurately and locked by means of a slide, which is traversed along ways on the housing, to bring a groove into engagement with the stop for the working station. This slide is normally operated by means of a lever, but a solenoid can be provided, if required, to enable it to be controlled from the co-ordinate table. On machines up to 35 tons capacity, turret indexing is effected manually, and a telescopic arm can be provided to facilitate the operation. The turret of a machine with a capacity of 50 tons or more is turned by power, under push-button control, and the transmission system incorporates a slipping arrangement, to ensure that no damage is caused if the locking slide is engaged before drive is released.

The press tool at the working station is operated by a hardened and ground ram, which is mounted in long, adjustable ways on the upper part of the fabricated steel frame. Motion is transmitted to this ram by an eccentric shaft, which runs in



Edel turret press, with co-ordinate setting work-table

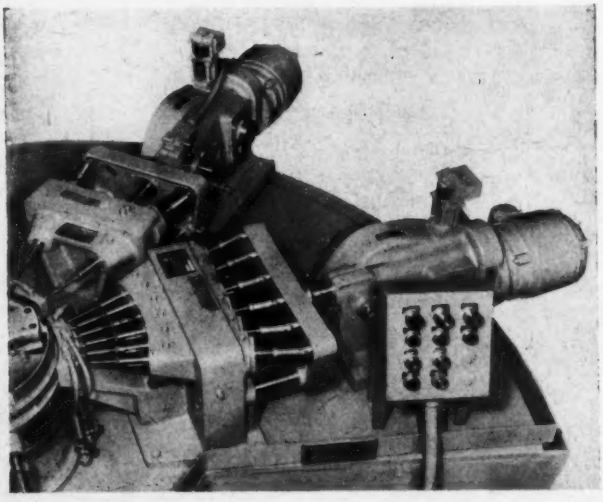
special bronze bearings, and drive is taken from a star-delta motor to a balanced flywheel, and thence through roller bearing-mounted shafts and totally-enclosed reduction gearing. A hardened and ground, multi-tooth dog clutch is incorporated in the transmission. To facilitate setting, the ram may be adjusted vertically by means of a hand-wheel.

Fan-type Unit Drilling Heads

To facilitate drilling and tapping holes in the gimbal ring for the Hawk missile, Edlund Machinery Co., Cortland, N.Y., U.S.A., have supplied to the Missile Systems Division of the Raytheon Co. three special-purpose machines which are equipped with unit drilling heads built by the United States Drill Head Co., Cincinnati, Ohio, U.S.A. These heads are of the company's standard and fan types, and examples of the latter are seen in the accompanying close-up view.

The super-finished multiple drilling spindles of each of these heads are mutually inclined, at various total angles up to 90 deg., and are mounted in a housing attached to the machine base. Feed movement is obtained by traversing the spindles axially through the housing, and for this purpose, the rear ends are connected to a pusher plate, which is guided by cylindrical bars that project from the housing. The movement is applied by means of a cam-operated Edlund unit, the flanged quill of which is secured to the plate. Drive for the head is also taken from this unit, by a shaft which extends through the pusher plate, and is transmitted to the spindles, some of which are rotated at speeds in excess of 2,500 r.p.m., by special gearing in the housing. Shaved gears are employed, and the splined shafts on which they are carried—also the drilling spindles—run in ball bearings.

Fan-type heads can be built to suit a wide variety of requirements where the individual hole axes are not parallel. Mounting arrangements can be provided to suit individual applications, to permit easy installation and removal. The heads may be mounted horizontally or vertically, also on standard drilling machines, and it is stated that the open design affords ready access to the spindle chucks for tool changing, and enables drilling and tapping to be carried out at successive stages with the same unit.



Mounted on a special-purpose Edlund machine, these fan-type multi-spindle drilling heads, made by the United States Drill Head Co., provide for machining mutually inclined holes

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DOHMPOWDER NYLON POWDER. The Plastics Division of Dohm, Ltd., 167 Victoria Street, London, S.W.1, has introduced Dohmpowder type 6 nylon powder which is suitable for dip or flame spray coating. The corrosion resistance of this powder is stated to be very satisfactory except against mineral acids, and it has an electrical resistance of 600 volts per 0·001 in. thickness of coat. Deposit thickness obtainable by dip coating ranges from 0·010 in. to 0·025 in., and by flame spraying, from 0·010 in. to virtually any economical value. The working temperature range is from −40 to +140 deg. C., and the approximate melting point is 190 deg. C. Coatings have a relatively high impact strength and are claimed to be particularly suitable for application to metal and glass. Dip coating is most suitable for articles produced in light industry, for example, electrical goods and metal window frames. Flame spraying, it is suggested, could be employed for coating car and commercial vehicle bodies, storage tanks, and other parts too large to permit dipping to be carried out.

THE PRODUCTION OF FORK-LIFT TRUCKS in the first quarter of this year rose to 1,679, compared with 1,210 for the same period of 1960. Total values of all types of powered industrial trucks delivered in these periods were £2,523,000 (1960) and £3,406,000 (1961).

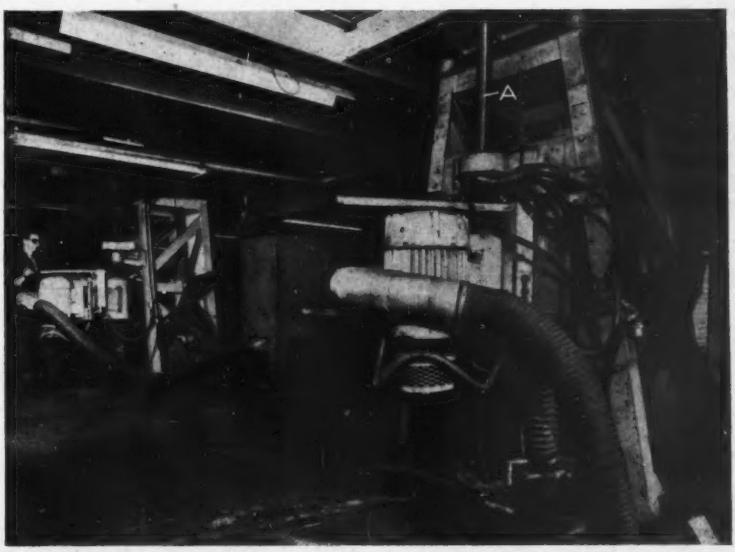
Improved Facilities for Continuous Casting of Encon Copper-base Bearing Alloys

THE WORKS OF ENFIELD ROLLING MILLS, LTD., Brimsdown, Enfield, Middlesex, have recently been extended, and additional equipment has been installed, which has enabled the production of Encon continuous cast rods, tubes, and bars of special cross section, to be doubled. New stores and despatch departments have been provided, to give improved facilities for the distribution of stock products in this range, which now includes more than 1,500 items, to customer firms and to the company's depots in various parts of the country.

Continuous cast rods, tubes and bars can be produced in phosphor bronzes, leaded phosphor bronzes, gunmetals, and leaded gunmetals, to the B.S. 1400 specifications, and to others if required. Solid bar is made with diameters from $\frac{7}{16}$ to $6\frac{1}{16}$ in., and tubes with outside diameters from $\frac{25}{32}$ to $6\frac{1}{16}$ in., and bores down to $\frac{15}{32}$ in. Dimensional limits for bars and the outside diameters of tubes are $+0{\cdot}004$ $-0{\cdot}006$ in., and the concentricity of the bore with the outside diameter of a tube is held within 1½ per cent of the wall thickness. Bars are normally supplied in lengths up to 12 ft., but longer bars can be provided if required. All bars produced in the plant are mechanically straightened, so that the arc depth in any 5 ft. length does not exceed ¼ in.

The procedure for the production of Encon bars was described in some detail in MACHINERY, 90 / 417—22/2/57, and it will be recalled that two Birlec-Detroit 500-lb. capacity rocking arc melting furnaces, and associated continuous casting plants, were then employed. A third Birlec-Detroit furnace, with the necessary casting plant, has now been installed, and provision has been made for a fourth to be brought into operation in the future. The continuous casting plant is similar to that developed by the American Smelting & Refining Co., New Jersey, U.S.A., and is operated under licence from that company.

Constituents of the alloy to be melted are weighed into a wheeled skip, which is then raised to the top floor of the 4-storey building. Here, the constituents are discharged from the skip into one of the melting furnaces. When the melt is ready, the furnace is tilted hydraulically for transferring the molten metal into the charging box of the adjacent casting furnace, which is lined with refractory, and is heated by carbon resistors. A supply of nitrogen is maintained in the furnace to provide an inert atmosphere to prevent oxidation of the metal. At the beginning of the casting operation, a starter bar is inserted in the water-cooled graphite die which is mounted at the lower end of the furnace. When the shut-off plug has been opened by means of a handle on the casting floor below the furnace, molten metal enters the die and freezes on to the starter bar. The latter is



In this view are shown two flying cut-off machines installed at the works of Enfield Rolling Mills, Ltd., for cutting pieces of required lengths from continuous cast bar

K2

then drawn downwards by a roll mechanism installed on the casting floor. When the metal emerges from the die, it has cooled sufficiently to support the molten mass above, and casting continues as long as the cooled metal is withdrawn from the die at a constant speed. The starter bar is removed when the cast bar or tube emerges from the rolls.

The bar then passes through a hole in the casting floor to the next level in the building, where it is cut into the required lengths by a resinoid-bonded abrasive wheel mounted on the motor-driven spindle of a flying cut-off machine. Two cut-off machines, associated with separate casting plants, may be seen in the figure, and part of a continuous bar is indicated at *A*. The counter-balanced cut-off machine is secured to the cast bar by means of a clamp, so that it travels with the bar for the cutting operation, and is guided by means of rollers, which engage with the faces of a vertical steel column of hexagonal cross section. The piece cut-off from the bar is received by a tube on the ground floor of the building. This tube, which is pivoted, is then swung downwards to discharge the piece on to a horizontal run-out table, where it is inspected and then passed to the straightening machine.

Very little wear on the die takes place during casting, and it is stated that a single die may be maintained in continuous operation for a period exceeding 100 hours, and that the amount of metal cast per hour may range from 100 to 800 lb. Since, however, a new die is employed at each set up, the average working life is about six hours. Dies for continuous casting are made in a separate shop at the Brimsdown works. In addition, a well-equipped machine shop has been provided for the production of components such as bushes, bearings, washers and valve guides from Encon continuous cast bar, on a contract basis for customer firms.

Transfer Mechanism for Cylindrical Workpieces

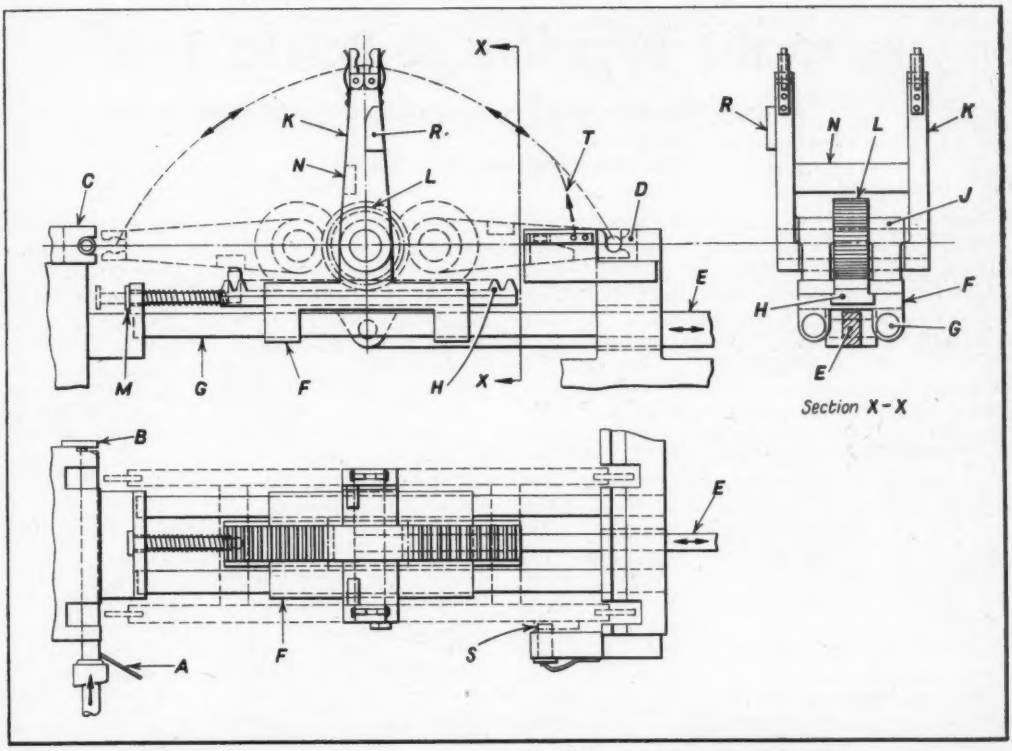
By L. KASPER

AN ARRANGEMENT FOR TRANSFERRING cylindrical workpieces from one work station to another is shown in three views in the accompanying figure. The mechanism was developed specifically for removing cut-off lengths of tubing from a sawing machine and delivering them to an adjacent work station, but it can readily be adapted for other types of workpieces. Shown diagrammatically at the left in the plan view, the saw *A* is set to sever the tube at an angle to the longitudinal centre line. The tube is fed in the direction of the arrow by a grip-and-release collet arrangement, which advances it to the stop *B*. As it is advanced, the tube is thrust into the throats of two members *C*, and subsequently the transfer mechanism provides for withdrawing the cut-off length from these members, swinging it up and over through 180 deg., and depositing it in two further slotted members *D*. The tube is subsequently ejected from these members by a plunger-type device, not shown.

In the figure, the mechanism is seen at the mid-point of its travel, and the prime mover is the rectangular-section bar *E*, which is reciprocated longitudinally by a cam (not shown). One end of this bar is attached to a block *F*, which is arranged to slide on cylindrical guide bars *G*. In the upper surface of this block there is a central channel, in which the rack *H* is free to slide, and projecting from the block at either side of this channel there are bearing bosses *J*. A shaft passes through these bosses and to each end of it is keyed an arm, as at *K*, the two being accurately aligned with each other. Keyed to the centre of the shaft, and guided between the inside faces of the bosses *J*, is a pinion *L*, which is in mesh with the rack *H*.

Projecting from the left-hand end of the rack *H* is a headed stud *M*, which passes through a guide block, and the compression spring seen on the stud continually urges the rack to the right. Starting from the mid-travel position seen in the side view, and assuming that the bar *E* is moving to the left, the pinion *L* is rolled along the rack (which is held stationary by the compression spring) and the arms *K* turn in an anti-clockwise direction. This movement is arrested when the plate *N*, which bridges the two arms, makes contact with a stud *P*, projecting from the teeth of the rack.

Since the arms can no longer turn, the rack *H* and the block *F* move to the left as one unit, partially closing the compression spring, and the spring-loaded fingers at the ends of the arms *K* are thrust over the tube in the members *C*. The cam which moves the bar *E* has a dwell portion, which retains the mechanism in this position while the saw *A* advances to sever the tube. Subsequently, the cam starts to return the bar *E* to the right, and for the first part of this movement the block *F* and the rack *H* travel as one unit, the rack being moved by the compression spring. During this stage, the



Mechanism for transferring cut-off lengths of tube from a sawing station to an adjacent machining position

arms do not move angularly, and the tube is withdrawn from its seatings. Immediately the head on the stud *M* abuts the associated guide block, however, movement of the rack is arrested. The block *F* continues to move to the right, and the pinion *L* starts to roll along the rack, the arms being thus turned in a clockwise direction until ultimately the tube is deposited in the slots in the members *D*.

During the final stage of the angular movement of the arms, a projection *R* passes the spring-loaded latch *S*, which is thus thrust back into its housing. Immediately the projection is below the latch, the latter advances again to the position shown. The bar *E* is now moved to the left once more, and in the early stages of travel, angular movement of the arms *K* is prevented by the engagement of the projection *R* with the underside of the plunger S. As a result, the block *F* and the rack *H* again move as a complete unit, against the action of the rack spring, and the arm fingers are pulled from the tube, which remains in the members *D*.

Immediately the projection *R* is clear of the plunger *S*, the arms are free to move angularly, and initially such movement occurs fairly rapidly, since the rack *H* is moved quickly to the right when the compression spring re-asserts itself. The path of the arm fingers during the early stages of the return movement is shown by the dotted curve *T*. Excessive angular acceleration during this period is prevented by providing a suitable cam surface on the projection *R*, to ensure that it disengages gradually from the latch S.

PEDAL CYCLES delivered during April of this year totalled 208,000, which was 4,000 more than the figure for the same month in 1960. Cycles exported in April, 1961, reached a total of 148,000, and this figure was 2,000 more than the highest monthly total for the previous year.

Automatic Detection of Broken Tools

Some Methods Employed on High-production Machine Tools

By KARL-HEINZ WOLFRAM, Dipl. Ing.

WITH THE INCREASING USE of fully-automatic high-production installations, such as transfer machines and link-lines, the importance of providing means whereby tools are continuously monitored during operation has become more apparent. If costly and time-consuming interruptions to production are to be avoided, or reduced to the minimum, it is essential that broken tools—notably drills, taps, reamers and counterbores—should be detected and that the required action should be taken immediately. Extensive damage can result, for example, if a tapping-size drill breaks in a workpiece and the latter is then automatically transferred to a tapping station. If a signal can be transmitted at the moment of breakage—or at least before the next machining cycle has been started—it can be ensured that only one tool and one workpiece are affected.

One of the most common methods of continuously checking drills and taps, or the holes that they produce, is by the provision of specially-designed probes. These units can be applied in two ways, namely, by introducing a probe into the hole, or by advancing a probe towards the tool, after the latter has been withdrawn from the work. It will be appreciated that if the hole is faulty, or contains part of a broken drill, the probe cannot complete its full stroke, and a simple switching system can be arranged to interrupt the automatic cycle and operate an audible or visual alarm. A similar arrangement can be provided in connection with a tool-probing mechanism.

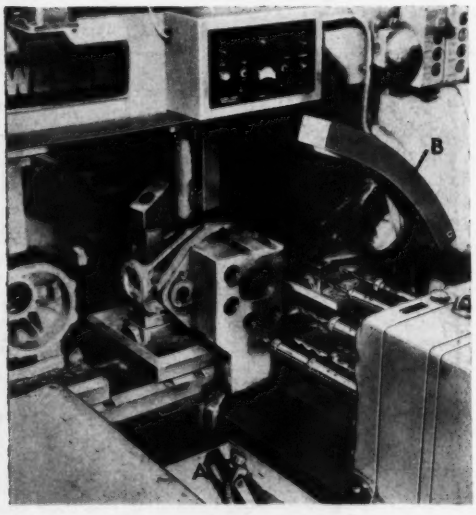


Fig. 1. A photo-electric arrangement whereby the tools in a multi-spindle head are continuously monitored for breakage by means of a number of light rays converging on a single receiver cell

With these methods, time must be allowed during the machine cycle for the probing operation to take place, and the mechanism must provide for swinging the probe clear of the tool-path before the next cycle is started. From these standpoints, certain advantages are offered by photo-electric monitoring systems, since they can invariably be mounted permanently clear of the working zone, and extra time need not be allowed in the automatic cycle for their operation. An example of a photo-electric monitoring arrangement for a multi-drilling head is shown in Fig. 1. The receiving cell is indicated at *A* and is arranged to be at the focal point of a number of lamps in the arcuate container *B*. The lamps and receiver are on opposite sides of the battery of drills and it is arranged that at all positions of travel of the multi-spindle head each of the rays from the lamps in the housing *B* is obstructed by one of the tools.

If a tool should break, however, light from the associated lamp will fall on the receiver *A*, and an electric circuit will be completed to stop the machine and energize a suitable alarm signal. It will be appreciated that if the tip of a drill is broken the monitoring system will operate only when the spindle head is in the fully withdrawn position. With such an arrangement, care must be taken to prevent swarf and other foreign matter from collecting on the receiver *A*, which would have the effect of obscuring the cell artificially, and of preventing the system from operating.

Broken or damaged tools can also be detected electrically, by measuring the inductance of a drill, for example, before and after an operation. With

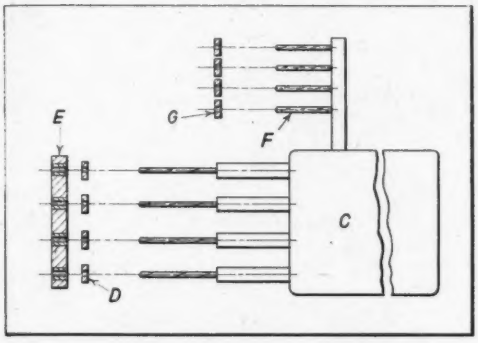


Fig. 2. Diagram showing an arrangement of "balanced" pairs of inductance coils for monitoring drills in a multi-spindle head

one such arrangement a coil is mounted adjacent to a guide bush for a drill. As the drill is advanced towards the bush it first passes through the bore of the coil, and a cam on the spindle head is set to operate a switch whereby the coil is energized when the point of the drill has just passed the inner end of the coil, but has not yet entered the guide bush. In these circumstances, the drill extends for the full length of the coil, and a high inductance is obtained.

Assume, however, that as a result of a subsequent operation, the point of the drill is broken. Under automatic control, the spindle head is withdrawn fully and is then advanced for the next cycle. When the cam-operated switch energizes the coil on this occasion, however, there is a shorter length of drill within the bore of the coil—since the point is broken—and a lower inductance is obtained. This reduction in value can be utilized to operate a relay, for example, to stop the machine and initiate an alarm system. With the inductance method, damage affecting the length of a drill by as little as 0·020 in. can be detected.

For some applications, however, it may not be practical or convenient to employ cam-operated switches for energizing the inductance coils. For deep-hole drilling, with step feed and rapid withdrawal of drills for swarf clearance followed by rapid approach, it may be preferable to employ the arrangement shown diagrammatically in Fig. 2. This system is based on the principle of comparing the inductances from associated pairs of coils, which are arranged to be in "balance" under normal working conditions. At *C* in Fig. 2 is shown a 4-spindle head, and the inductance coils and guide bush plate are indicated at *D* and *E* respectively.

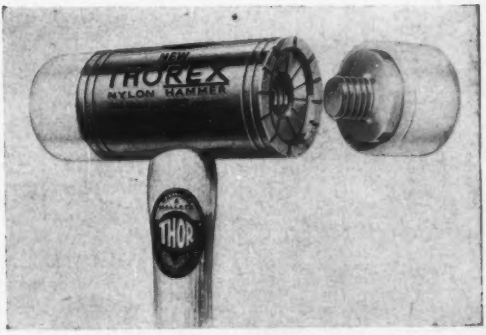
Attached to the spindle head there is a group of dummy tools, as at *F*, which are of the same diameter and length as those in the main head. Inductance coils *G* are also provided for these dummy tools and are connected by way of "balancing" circuits to the corresponding coils at *D*. It will be appreciated that the breakage of any tool in the main head will result in a change of inductance in its associated coil in the group *D*. Consequently, this change in inductance will upset the balance which normally exists with the corresponding coil in the group *G*, and the electrical circuit can be arranged to stop the automatic cycle.

Inductance monitoring equipment of the type here described is produced by A. Klenk, Ludwigsburg/Württ., Germany.

New Thorex Nylon-faced Hammer

The Thor Hammer Co., Highlands Road, Shirley, Birmingham, have introduced, as an addition to their range, a hammer provided with renewable faces of Nylon, as depicted in the accompanying illustration. The steel head is internally-threaded and recessed at both ends to receive the Nylon face-pieces, which are shouldered to provide additional resistance to shearing of the threads when angular blows are struck. Radial grooves cut in the end surfaces of the steel head are stated to afford a safeguard against loosening of the Nylon face-pieces in service, but do not prevent them from being unscrewed by hand, to facilitate replacement when worn.

New Thorex Nylon-faced hammers are at present made in a range of five sizes with renewable faces from 1 in. to 2 in. diameter, and with weights from ½ lb. to 3 lb.



The New Thorex hammer is provided with renewable Nylon faces

Diaphragm Chucking

By W. D. BARNETT*

WITH THE INCREASING need for accurate work-holding devices to keep pace with developments in machine tools, the diaphragm chuck has received much attention during the past few years. Although the principle has been known for a long time, it is only comparatively recently that such chucks have been developed to provide for highly-accurate holding, as now required.

The principle of operation involves the deformation of a flat metal diaphragm by mechanical, hydraulic or pneumatic means, the stored energy then being used to grip the work when the pressure on the diaphragm is released. Fig. 1 gives a sectional view of a typical chuck of this type. The diaphragm *A* is distorted outwards by the pusher sleeve *C* when pressure is applied to the piston *B*. The work is then inserted between the jaws, and when the air or hydraulic pressure behind the piston is released, the diaphragm tries to resume its normal shape, and the jaws close.

As indicated in Fig. 2, the jaws do not remain parallel as they open, and they therefore require to be ground accurately to size at the gripping diameter, with the diaphragm under pressure. Grinding is stopped when the work is a tight push fit in the jaws, and it is then only necessary to increase the air or hydraulic pressure slightly to allow the work to be inserted easily. Certain restrictions must be borne in mind in considering whether diaphragm chucking is suitable for a particular workpiece. In the first place, the jaws have only a limited movement, and the part to be held must have a machined surface where the jaws grip. The more accurate this gripping surface, the more accurate will be the final machining operation. However, the diaphragm chuck will normally tolerate a variation up to ±0·0025 in., and still give satisfactory results.

The second restriction is the gripping force available, the maximum force exerted by a diaphragm depending upon its size. As a guide it may be noted that a 5-in. diameter chuck will exert a force up to 1,100 lb., a

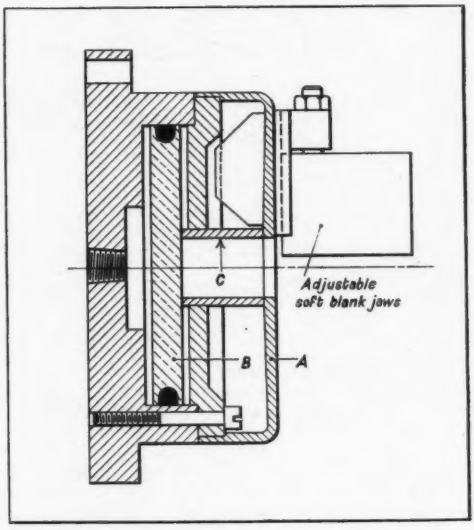


Fig. 1. A typical diaphragm chuck

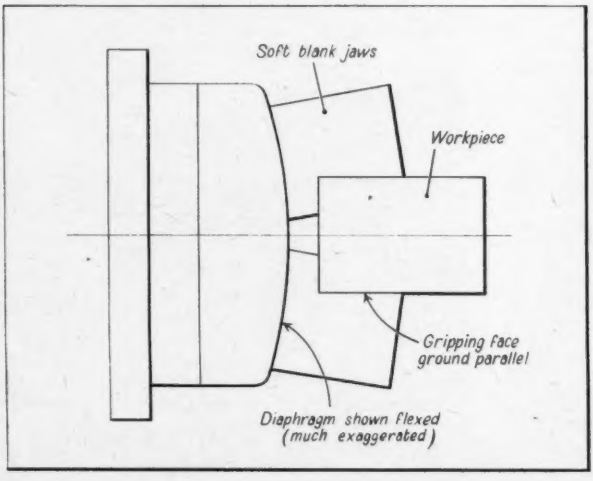


Fig. 2. Diagram showing, much exaggerated, the effect of flexure of the diaphragm

* F. Pratt & Co., Ltd., Lister Lane, Halifax.

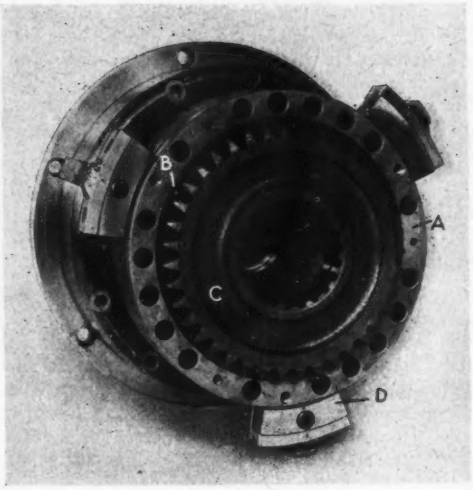


Fig. 3. Pitch-pin diaphragm chuck with interchangeable cages for different gears

7 in. chuck, up to 1,900 lb., and a 10 in. chuck, up to 4,000 lb. Where a gripping force lower than maximum is required, for instance, to prevent distortion of thin-wall components, the jaws are ground out at a lower applied pressure.

Diaphragm chucks are constructed either with or without end stops between the jaws and at the centre, end stops being very desirable when a component must be machined accurately to length. The diaphragm, by the nature of its grip, tends to pull the component back against the stops during the closing action, thus ensuring accuracy of location. It is therefore preferable to make use of this feature where possible, rather than rely on steps in the gripping jaws for endwise location.

A diaphragm chuck is usually employed for quantity production and is often designed for one particular component. This applies, for example, to pitch-line gear chucking, where the pitch pins are brazed to the diaphragm in positions to suit the gear, since the number of teeth is not always equally divisible by the number of pins. Often a chuck can be made to hold a number of different gears when the quantities do not justify the provision of a chuck for each design. For this purpose, an interchangeable cage may be provided for the pitch pins, as illustrated in Fig. 3. The cage *A* is held in position by three screws in the end stop locators, and the three ball-ended pitch pins *B*, which engage the teeth of the workpiece *C*, are a sliding fit in radial holes in the cage. The gripping pressure is applied to the pins by three equally-spaced diaphragm jaws *D*. With this arrangement, it is necessary to provide only a cage for each size of gear, and the cage is easily changed by removing three screws.

Diaphragm chucking is of particular advantage when high accuracy and light gripping are required, as in grinding and fine boring. The method can, however, be sometimes adopted where extreme accuracy must be combined with heavier cutting. As an example, it was required to cut internal helical gear teeth in a ring component, on a Drummond Maxicut 2A vertical gear shaper. A special diaphragm chuck, shown in Fig. 4, was employed to withstand the very heavy torque load. The chuck is of generally conventional design, with brazed-on jaws to suit the component, but attached to the diaphragm is a drawbar which passes through the machine spindle and is connected to an air cylinder. By selecting the right size of cylinder, any desired gripping force can be obtained, while retaining all the features of a normal diaphragm chuck.

If a component is too long for the jaws of a

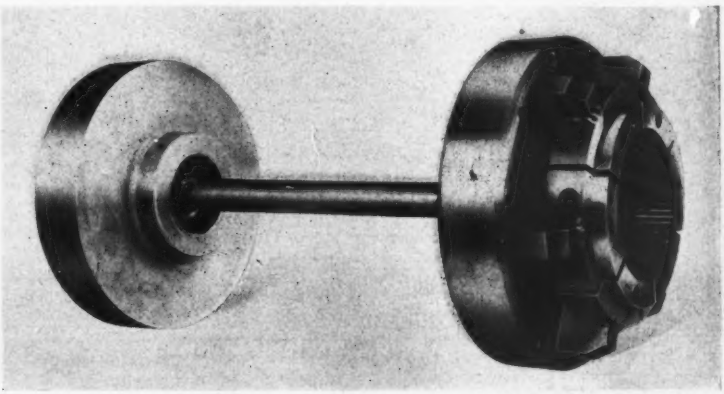


Fig. 4. Special diaphragm chuck for gripping rings in which internal helical gear teeth are to be cut

conventional chuck, it may be possible to employ a double diaphragm chuck to provide for gripping at both ends. Again, a chuck can be so designed that a long shank on a workpiece is accommodated in the machine spindle, and supported by a centre.

Although diaphragm chucking has been employed to solve numerous problems, it appears that its potentialities are by no means fully appreciated. It is strongly recommended, however, that anyone contemplating the adoption of this method of work-holding should consult one of the specialist companies at an early stage.

Producing Accurate Eccentric Shafts and Housings

By W. SHARP

A batch of eight eccentric shafts and mating eccentric housings, as shown at *A* and *B*, Fig. 1, was required to be produced, with the offset on the shafts within 0·0002 in. of that of the housings. Location of the parallel portions of the components in fixtures would not have guaranteed the accuracy required, and it was decided therefore, to provide for location from taper surfaces.

The housing *B* was finish machined all over except for the 4·3311/4·3297 in. eccentric bore, which was roughed out on a drilling machine to approximately the required offset. Next, the taper portion was accurately ground to fit a special mild steel locating sleeve seen at *x* in Fig. 2. For finish boring the 4·3311/4·3297-in. eccentric diameter, the taper portion of the workpiece was inserted into the locating sleeve, and the latter, in turn, was located in the spindle nose of a Swift 12V6 centre lathe. For clamping, a plate was applied to the front of the workpiece, and pulled back by studs which were passed through the holes in the spindle nose.

Initially, the eccentric shaft was turned and ground concentric along its entire length, the

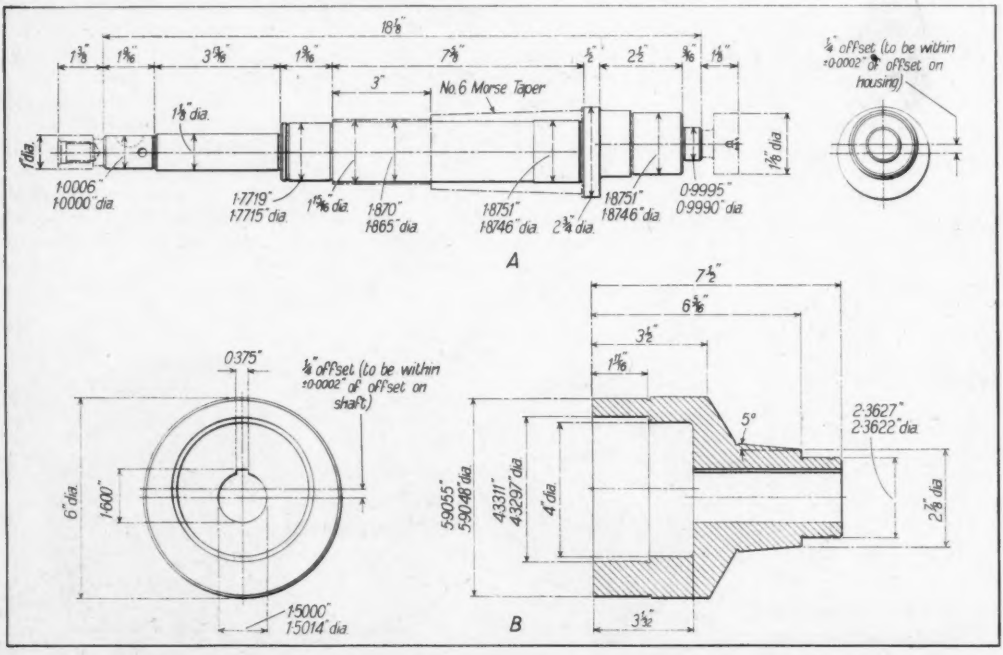


Fig. 1. A shaft component *A* and a mating sleeve *B* which were required to be machined to an accuracy of 0·0002 in. for eccentricity.

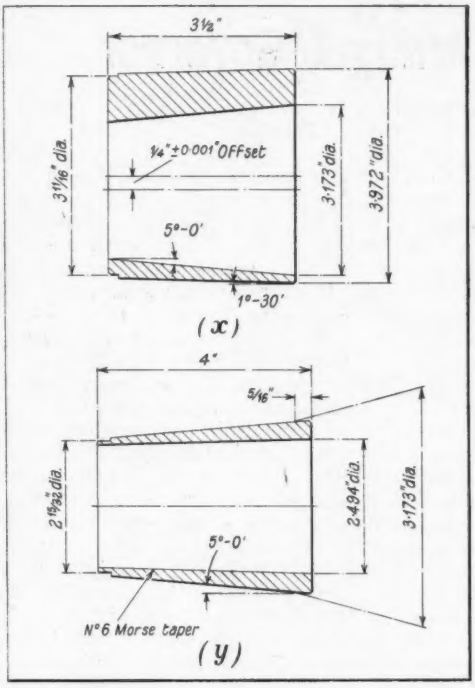


Fig. 2. Locating sleeves employed for the eccentric boring and turning operations

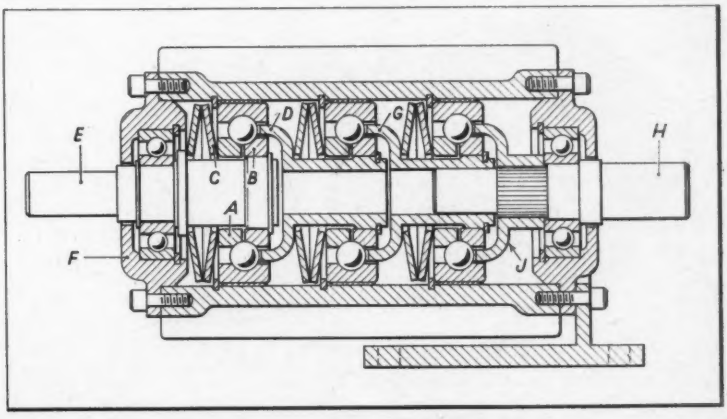
portions shown chain dotted in Fig. 1, being provided for manufacturing purposes. These extra portions comprise an extension at the left-hand end, with a tapped hole to receive a draw bar, a right-hand extension to take a centre hole which otherwise would have come too close to the outside of the smallest eccentric diameter, and a section of No. 6 Morse taper near the centre, for location purposes.

For turning the eccentric portions of the shaft, the Morse taper was inserted in the sleeve shown at *y* in Fig. 2, which, in turn, was located in the sleeve *x* already in the spindle nose of the lathe, the shaft being held by a drawbolt in the tapped hole. When the eccentric portions had been finished, the end extensions and taper section near the shaft centre were removed.

Angus Ball Drive Units

Reference was made in MACHINERY, 98/1028—3/5/61, to the ball drive units, of patented design, which have been introduced by George Angus & Co., Ltd., Gear Division, Hebburn-on-Tyne. In these units, rolling bearings are employed as epicyclic reduction gears to provide a friction drive, and a typical arrangement is shown in the accompanying drawing. The actual speed reduction between the inner race and the cage depends on the relative diameters of the balls and the tracks of the inner and outer races. For bearings of normal proportions, each reduction ratio approximates to 2·4 to 1 and 3·2 to 1.

For this design of reduction gear, ball or taper roller bearings can be used, but radial ball bearings are preferred. Inner races of the bearings in the unit shown, are split circumferentially, as indicated at *A* and *B*, and the friction drive is obtained by applying axial pressure through the medium of spring-steel dished washers *C*. The ball cage, as at *D*, forms the mounting spigot for the inner race of the following bearing, and the total reduction obtained depends upon the number of bearings coupled in series. A ball bearing in the end cover *F* supports the input shaft *E*, and the second ball cage *G* runs on an extension of the output shaft *H*. Splines in the cage *J*, of the last bearing, transmit the drive to the output shaft. The unit is filled with oil, and there are cooling fins on the casing.



Angus ball drive speed reduction unit

A Quick-acting Centrifugal Governor

By J. BOAS POPPER

A STEAM TURBINE installed in a chemical plant was required to operate up to a certain rotational speed, and the use of a conventional centrifugal governor was not acceptable, as it was essential to provide some device that would be virtually instantaneous in operation. As a result, the quick-acting centrifugal governor shown in Fig. 1 was developed, which is unorthodox in design and has proved very effective. In operation, the unit is rotated about its longitudinal centre line, and in Fig. 1 is shown in what may be termed the "closed" position. The various moving parts are in the positions illustrated when the governor is stationary, also when it is approaching—and is very close to—the maximum allowable speed. In these conditions, the small diameter plunger *A* projects only slightly from the body of the unit. When the required speed is reached, however, the moving parts rapidly change positions, and as a result the plunger *A* is extended, this axial movement being employed to regulate the steam supply to the turbine.

The principle on which the governor operates is shown diagrammatically in Fig. 2. A shaft *B* is carried in bearings and is driven directly from the turbine, or indirectly at a proportional speed. At one end of the shaft *B* there is an arm *C*, which is pivoted at its centre point and can oscillate through a limited angle, about an axis which is at right-angles to the longitudinal centre line of the shaft *B*. Also attached to the shaft *B*, and arranged to rotate with it, is an arm *D* which serves as an anchor point for one end of a tension spring. The other end of this spring is attached to the arm *C*, and serves to bias the arm in an anti-clockwise direction, to hold it in contact with the limiting stop *E*. This stop, also that indicated at *F*, is attached to, and rotates with, the shaft *B*.

It will be appreciated that as the speed of the shaft *B* increases, a point will be reached at which centrifugal force exerted by the weights on the arm *C* is greater than the restraining force of the tension spring. The arm *C* will then move rapidly in a clockwise direction, to take up the position shown by the dotted line in Fig. 2, and this movement can be converted to linear motion and utilized to control a servo-system. It should be mentioned that the anchor bracket for the tension spring must be movable axially in relation to the shaft *B*, so that when the arm *C* is in the dotted position the spring is still at right angles to the shaft *B*. Immediately the rotational speed falls, and likewise the centrifugal force acting on the arm *C*, the tension spring takes charge and the mechanism is rapidly returned to its original setting.

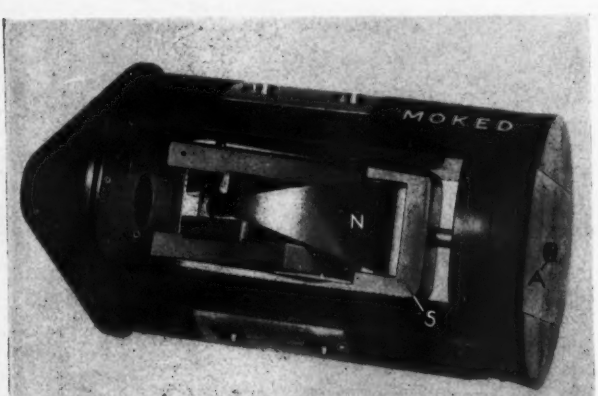


Fig. 1. General view of a new quick-acting centrifugal governor, designed to control a steam turbine

Three sectional views through the unit shown in Fig. 1 are given in Fig. 2, and reference will first be made to the view at *X*. It should be noted that in this view the governor is shown in the "open" position, the centrifugal force having overcome the spring, so that the plunger *A* is extended. There are two weights, one of which is indicated at *G*, and these weights are arranged opposite to each other and are pivoted at their centre points. The weights *G* are similarly lettered in the section *Z-Z* and *Y-Y*, where the pivot bearings, which are of the needle type, are indicated at *J*. These weights are of brass, and are "crossed," the other weight, not shown in the view *X*, being arranged with its longitudinal centre line inclined in the opposite direction.

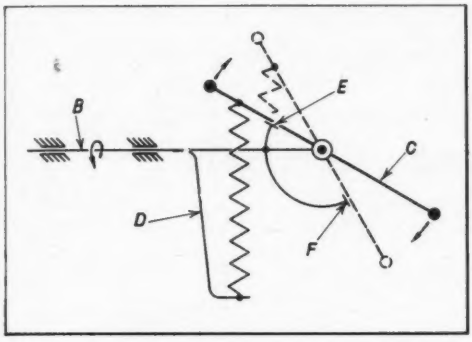


Fig. 2. The principle of operation of the governor is here shown in diagrammatic form

At the centre of each weight there is a steel portion, as at *H*, which has an irregularly-shaped projection, indicated at *K*. These projections "overlap" each other, and when the governor is in the open position they abut at the point *L*, to limit the turning movement of the weights. In the closed position, the projections *L* abut at the points *M*. It should be mentioned that in the view at *X* both the projections *K* are shown, for purposes of explanation, although that shown shaded would not actually be visible in the plane of section.

In the practical application, the tension spring shown in Fig. 2 is replaced by the C-spring *N*, which is indicated in all three views of Fig. 3, also in Fig. 1. It will be seen that this spring tapers to a point at each end, and is widest at the middle, since with this design linear force characteristics can be combined with a large allowable deformation. Moreover, with a spring of this type, a line joining the ends will always be perpendicular to the centre line of the unit, which is a geometrical requirement of the design. The ends of the spring are secured in small holes in the edges of the projections *K*, and the tendency is for the spring to turn the weights about their respective axes and to bring the points *M*, on the irregularly-shaped projections, into abutment.

Projecting from one face of each weight *G* there is a small-diameter pin, as at *P*, which engages with a sheet-metal sliding member *R* (all views in Fig. 3). These sheet metal members are joined at one end by a bridge piece *S*, also indicated in Fig. 1, and this member, in turn, is secured to the plunger *A*. As the weights turn, the pins act in slots in the members *R* and move the latter in a direction parallel to the centre line of the unit, to extend the plunger *A*.

It will be appreciated that in service there is a strong centrifugal force acting along the axes of the bearings *J*, as the moving parts of the unit endeavour to spread. To accommodate this force, hardened steel end covers, as at *T*, are provided, which are secured to the body of the unit by means of screws.

In the application for which this governor was

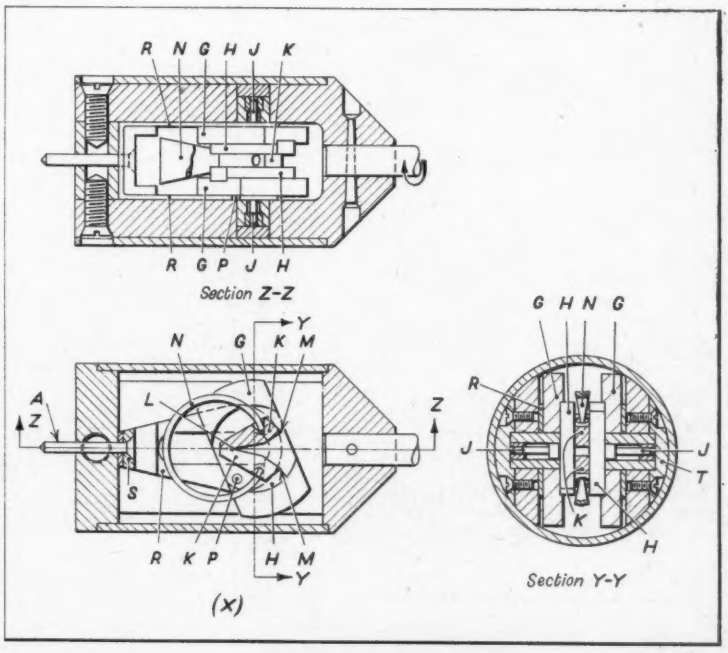


Fig. 3. Three sectional views of the governor, showing the practical application of the theoretical design in Fig. 2

designed, there was no necessity to provide for adjustment to suit various critical speeds. Such a facility can readily be afforded, however, by arranging for the effective radial distance of the weights to be adjustable relative to the pivot bearings *J*.

Governors of this type are produced by Moked, Haifa, Israel.

Rotary-cutter Attachment for a Lathe

By JOSEPH A. CIVITARESE

IT WAS REQUIRED TO MACHINE a number of annular grooves in the periphery of a cylindrical housing, for cooling purposes, as shown in Fig. 1, and for this operation the special lathe attachment seen in Fig. 2 was designed and made. The base *A* takes the place of the normal tool-post of the machine and at its centre there is a large-diameter tapped hole. Into this hole is screwed the shouldered post *B*, which has two portions of different diameters, ground accurately concentric. Arranged to turn freely on this post there is a sleeve *C*, with a large-diameter portion at its lower end, on the periphery of which plain spur gear teeth are cut.

At the top of the sleeve, there is a reduced-diameter portion which is threaded to receive the cutter *D* and a lock-nut to secure the latter in position. The sleeve *C* is retained on the post *B* by a washer, stud, and lock-nuts. Enclosing the toothed portion of the sleeve *C* there is a rectangular cover member *E*, which is bolted to the base *A* and serves to guide the rack *F*. This rack is supported at the required height above the lathe bed,

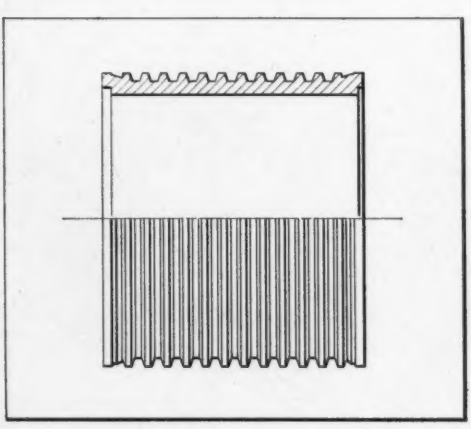


Fig. 1. The annular cooling fins on the periphery of this hollow cylindrical housing were machined on a lathe with the special rotary tool-post shown in Fig. 2

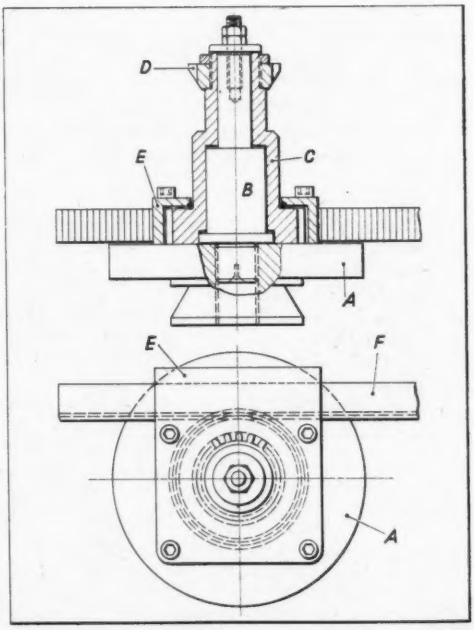


Fig. 2. Sectional and plan views of a special tool-post for use on a standard lathe. A disc-type toothed cutter is employed, and is rolled in "mesh" with the work to produce annular grooves

and accurately parallel to the latter, by special brackets secured adjacent to the headstock and tailstock.

The rack is held stationary, and when the saddle is traversed longitudinally, as for conventional turning, the sleeve *C* and the cutter *D* rotate, as a result of the engagement of the teeth with the rack. An O-ring in the cover *E* forms a seal with the centre portion of the sleeve *C*, to exclude dirt and swarf from the meshing area of the rack *E*. With this arrangement, the cutter teeth "mesh" with the workpiece, and machine the annular grooves shown

in Fig. 1. Provision is made, in the brackets which support the rack, for adjusting the latter transversely, between cuts, so that the tool-post can be fed forward to the required depth, also for setting the equipment in order to suit workpieces of different diameters.

The device can also be applied to facing operations, by mounting the rack at right-angles to the bed-ways, and with this arrangement a series of concentric grooves can be machined in a workpiece.

Moreover, for conventional turning work, a plain disc-type cutter can be substituted for the toothed cutter *D*. For this application, the cover member *E* is turned through 180 deg., to bring the rack into mesh with the opposite side of the sleeve *C*, to reverse the rotation of the latter so that the cutter turns "against" the direction of feed motion of the saddle.

Advantages gained from this method of turning include increased tool life, since wear is distributed over a greater length of cutting edge than is presented by a conventional tool, and the elimination of thread-type feed marks.

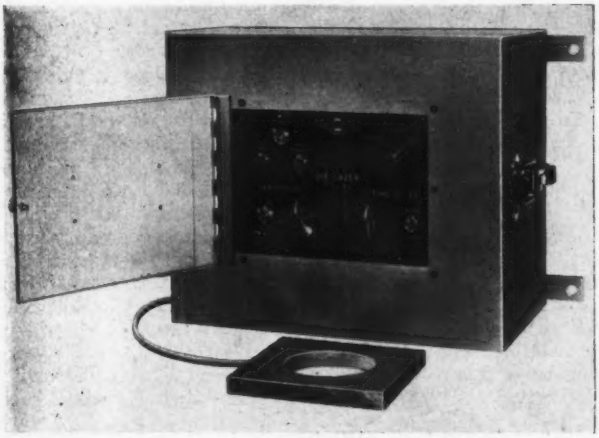
Radiovisor No. 27B-R Robotron Die-Saver

Known as the No. 27B-R Robotron Die-Saver, the equipment shown in the accompanying illustration has been introduced by Radiovisor Parent, Ltd., Stanhope Works, High Path, London, S.W.19, and is intended to prevent damage due to the incomplete ejection of parts from the tools on power presses. It is suitable for use on machines which are electrically controlled, or can be modified to provide for electrical operation of the clutches.

Housed in a steel case measuring 13 by 10 by 7½ in. internally, the control unit may be attached to the frame of the press, and incorporates a relay, which is energized initially by the electrical signal transmitted when the capacitance of an oscillator coil, mounted in a remote detector head, is altered as a completed workpiece moves past it. In this way, a set of normally-open contacts is closed, to permit the press to start a fresh operating cycle. The relay remains energized, under the control of an electronic timer, for a period which may be pre-set to correspond to the time which elapses between the production of successive components.

With this arrangement, the normally-open contacts are maintained in the closed position so long as signals are received at the correct intervals, and operation of the machine is permitted to continue. In the event of a component not being ejected past the detector, however, the contacts open, and the next cycle cannot be started. Provision is made for adjusting the sensitivity, to suit the size of the workpiece, and the unit will normally operate at rates up to 180 impulses per min.

A range of standard detector heads is available, and the type A seen in the figure can be supplied with a central opening of 1, 2, 3, or 6 in. diameter, and in thicknesses ranging up to 1 in. Parts may be passed through this opening, or the head may be mounted either above or below the ejection path. The type P head is intended for use where space is limited, or when it is required to provide for detection close to the tool, and measures ¾ in. diameter by 6¾ in. long.



The Radiovisor No. 27B-R Robotron Die-Saver control unit for use on power presses, incorporates a remote head for detecting the ejection of workpieces

INDUSTRIAL BUILDING IN GREAT BRITAIN. In the first quarter of 1961, approval was granted for the erection of a total of 548 industrial buildings in Great Britain, representing a floor area of 15,997,000 sq. ft.

Reaction of the German Machine Tool Makers to the Melman Report

By A CORRESPONDENT

THE MELMAN REPORT, which has been the subject of considerable criticism in this country, has provoked similar reactions in Germany, where the Machine Tool Makers' Association (V.D.W.) commissioned Dr. F. Eisele, of the Technical High School, Munich (himself a machine tool builder for twenty years), to examine the report. His conclusions, which are presented in a survey extending to some 9,000 words, are here summarized.

Any demand for a technical and economic assessment of a branch of industry which presents such remarkable differences between East and West as does the machine tool industry should be based on the most thorough enquiries. There are, in Europe, more than 1,700 machine tool makers, employing between 10 and 3,000 workers, and in accordance with statistical rules, an enquiry should have covered a minimum of 30 firms in each country, or a total of 200 firms. In fact, Prof. Melman only visited 15 large firms, and gave no indication of how these firms were spread over countries or branches of the industry. Other information upon which the report was based was supplied by about 100 experts including buyers, technicians, directors, and editors. The report, moreover, is not systematic, contains contradiction, and is of quite unnecessary length. The recommendations for the West are briefly as follows:

(*a*) Application of mass-production methods.
(*b*) Elimination of technical backwardness.
(*c*) Standardization and unit construction.
(*d*) Development of numerical control.
(*e*) Reduction in limits of accuracy and quality.
(*f*) Reduction in power.
(*g*) Reduction in number of types to increase productivity.

In connection with (*a*), it is unfortunate that no figures were given to indicate what is to be understood by mass production, and that there was no suggestion as to where the resulting quantities would be sold. To justify the criticism, however, constant reference is made to Soviet industry, although, as far as is known, the only example of mass production in the U.S.S.R. is provided by the lathe plant in Moscow, which is probably producing (today) 12,000 lathes annually, of a single type. The adoption of the Melman recommendations in this respect presents no technical difficulties, but there remains the question of marketing. In the machine tool industry, there is no need for mass production such as is required, for instance, in the motor car industry. Prof. Melman has succumbed to the idea that the economic law relating to consumer goods—that a lower price creates a bigger demand—will apply in this connection. Even the drastically reduced prices at which machines from the communist *bloc* have been exported to the West, however, have been insufficient to create any mass market for them.

Machine tools are not products which can be sold by mere catalogue description without special equipment. Any machine tool specialist knows that the more extensive the special equipment ordered in connection with any machine tool, the more likely it is that the machine is required by a works engaged in mass production. Whether the basic machine is produced in small or large batches, assembly and the provision of equipment for given duties will alway require special attention. Moreover, the demand for such specialized machines will inevitably become greater in the future however happy machine tool builders would be (if they had a choice) to be spared these difficult and costly orders, and permitted to concentrate upon series production, which is easy to supervise and lends itself to long-term planning. A table is included (not reproduced here) to show that in West European countries with the highest outputs of machine tools, total quantities of given machines are only modest, and would not permit series production on the scale of 10,000 per annum, even in connection with the types most commonly used.

Prof. Melman complained that the industry was backward, and that insufficient support was given to research. Dr. Eisele comments: Is it believable that machine tool specialists are so backward in their own domain when for more than 60 years they have proved themselves capable of solving the production problems of their customers such as the motor vehicle industry?

European industry is reproached for having taken advantage only to a limited extent of standardization and unit construction, but here again, Prof. Melman has omitted to submit concrete examples.

It is true that there are factories where standardization of parts could be extended, but very often the rate of development of types does not justify too great an expenditure of technical effort in this direction. Nevertheless, the majority of medium and large undertakings have, for decades past, developed and used their own standards, alongside the D.I.N. standards, to the limit of what is economically possible. In the same way, unit construction has been employed for decades for such elements as gearboxes, drives, clutches, hydraulic units, and switchgear.

The development of numerical control is constantly presented as if its introduction would result in a considerable increase in productivity, and it is complained that only a few firms have been active in this connection. The truth is that a steadily increasing number of firms has been so occupied for years, as could be seen at the 5th European Machine Tool Exhibition in Hanover in 1957, and the 6th in Paris in 1959. This fact has not been appreciated as Prof. Melman has only visited a few works. Further extension of numerical control in the field of machine tool building will only have limited possibilities in the near future, otherwise it is certain that it would be largely used in the machine tool industry of the United States, which is not the case, any more than it is in the U.S.S.R.

In certain paragraphs of the report, where Prof. Melman criticised unduly close limits and high quality, he touched on matters to which the industry is specially sensitive. It is precisely to this constant striving for increased accuracy and high quality that a great part of technical progress in general is to be attributed. While it is usually an absorbing and costly undertaking to develop and maintain a given standard of accuracy in a works, once this standard has been attained, there would, generally speaking, be no particular economy to be achieved by reducing standards to a lower level, and without such economic reasons it would be unreasonable to expect a firm to renounce such an important aspect of the superiority of its products. Experience of "war-time finish" was not, on the whole, encouraging.

The excessive power provided on Western machine tools, which Prof. Melman criticized, has often been discussed in various quarters during the last few decades. It is well known that, under actual working conditions, machines, in general, operate well below the limits of the power available because the majority of pieces to be machined do not demand that power, although the dimensions of such pieces may necessitate the use of a machine of a certain size. The maker is therefore always confronted with a choice. He may either equip a machine of a certain size with a motor of a power which is only sufficient for the average run of work, or may provide for the maximum. The decision reached is generally in favour of the latter, by the correct process of reasoning that the price of a machine depends essentially upon its size and equipment, and that the resulting economy from installing a smaller motor would only be insignificant, whereas the potentialities of the machine would be considerably curtailed. Consequently, the majority of makers as well as buyers prefer a drive that will meet maximum power demand.

Of all the recommendations and criticisms contained in the Melman report, only these concerned with rationalization of types and manufacturing programmes can be taken seriously as being partly capable of realization. These recommendations relate to: a reduction in the variety of machines covered by the production programmes of individual factories; a reduction by amalgamation of the number of works; development of unit construction; and concentration of production in specialized works (which would be difficult to arrange). Except in a state of emergency, there is no possibility of achieving these results in a democracy by Government decree, but only by voluntary agreement, encouraged possibly by example and by fiscal means, as far as anti-trust legislation will permit. Similar recommendations have been made in various quarters in the past, and they have been successfully carried out by such groups as V.D.F. and W.E.B.O. There have been, moreover, two tendencies of late which justify a certain optimism in this respect, namely: (1) the standardization of constructional units which was brought about with unexpected speed in 1959 as a result of pressure exerted by buyers in the motor vehicle field and under the aegis of V.D.I. (Association of German Engineers); and (2) the politico-economic competition of the Eastern *bloc* which is becoming more pronounced and is not to be countered by traditional methods. It would be a matter for congratulation if, amongst all the unjustified attacks and reproaches of the Melman report, these recommendations, which are at least partially capable of achievement, could help to accelerate a rationalization of manufacturing programmes which should not be too long deferred.

THE U.S.S.R.

Prof Melman makes reference to the Soviet machine tool industry very frequently, and although he states that at one end of the scale there are works producing in small batches by methods which are far more unproductive than any in Western Europe, his main emphasis is on factories

producing on mass-production lines. In this respect, he has probably been the victim of propaganda, since, as has been previously mentioned, it appears that there is only a single works of this type. This example, moreover, could not, in any case, be duplicated in the West, where the total production is not notably higher than the output of this one factory.

As regards research, E.N.I.M.S. and Tsnitmasch certainly have large staffs, well equipped buildings, and massive annual budgets, and have done valuable work. It would, however, be wrong to regard these institutes as being engaged merely in research work, as they are largely occupied with design and constructional projects, which, in the West, would be carried out in the machine tool factories. The design departments of Soviet works are generally very small, and do not reach the Western average. It may be noted, for instance, that the automatic production line for gears in the Moscow lathe plant was designed and built by E.N.I.M.S., whereas in the West, no one would think of allocating such work to a research institute. It is impossible, in the course of a short visit, to estimate the proportional division of an institute's activities between real research and other objects.

It must be recognized that the Soviet machine tool industry is concerned with a much smaller number of types than are the industries of the West, but this position is not attributable to any sudden programme standardization. It is, in fact, a planned feature in an industry which is state-controlled and which, for a long time past, has operated under its own Minister.

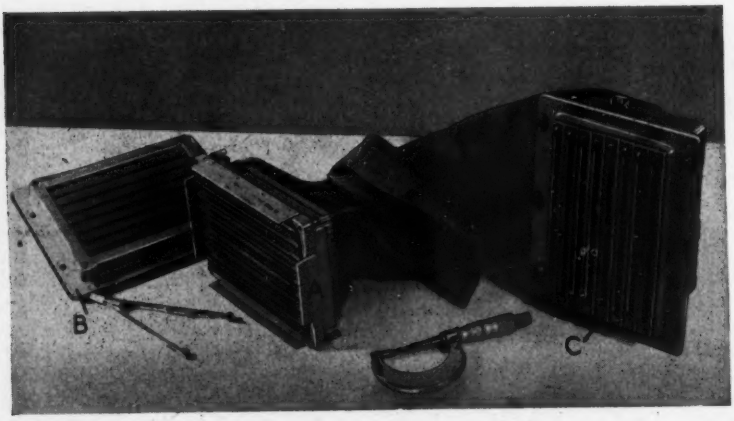
CONCLUSIONS

At the end of the German examination of the report, regret is again expressed that the enquiry was not undertaken by a machine tool specialist, and that, in consequence, it contains so many judgments and controversial propositions that there is little or no chance of utilizing it in the European industries, apart from certain points.

Contour Cable

The Hughes Aircraft Co., U.S.A., have developed a new type of flat and flexible conductor known as " contour cable ", which weighs little more than half as much as conventional wiring. It is a ribbon-like, multi-channel, cable, formed by embedding thin, flat, metallic strips in a plastics dielectric, and up to 40 separate conductors can be incorporated.

This cable, originally introduced to save weight and space in missiles, is shown in the accompanying illustration applied to a plug-in test unit. The assembly incorporates 16 cables, grouped in eight pairs, with 36 conductors in each, making a total of 576 separate connections. The pairs of conductors are attached to contacts in insert cards in the unit *A*, and they plug into the connector seen on the left at *B*. The contact unit at the opposite end of the cables is shown plugged into its connector, at *C*. The length of the cables connecting the contact units is 26 in., and in this distance, the cables are bent through 90 deg., and twisted 270 deg., when in service.



Contour cable developed by the Hughes Aircraft Co.

As an indication of the possible savings in weight, it may be noted that 1,000 ft. of conventional 20-conductor, 22-gauge, aircraft cable weighs 82 lb., whereas the same length of contour cable having the same current carrying capacity, weighs 52 lb.

Another advantage that is claimed for the contour cable is that it can be provided with an adhesive strip on one side, as a means of attachment to the wall of a missile, or to the fuselage or wing of an aircraft.

NEWS OF THE INDUSTRY

Leicester

WADKIN, LTD., Green Lane Works, are experiencing a steadily rising demand for their extensive range of woodworking machinery from customers in this country and in various overseas markets. Many orders are also being received for high-speed routing machines for non-ferrous metals and we may note that one of the smaller machines in the range—the LC 6—is in regular production. Interest in tape-controlled drilling machines is increasing and several are under construction or in course of development. These machines are offered with Airmec Autoset co-ordinate setting equipment, or, alternatively, with E.M.I. electronic positioning equipment. Large automatic machines for producing parts for the furniture industry and other branches of the woodworking trade are in progress in the shops.

Several new machine tools have been installed during the past year, including a Cincinnati No. 3 dial-type milling machine and Ward No. 7 and 3 DS capstan lathes. In addition, a Kendall & Gent plano-milling machine and a screw thread whirling machine are on order. A 2-storey works extension with 9,000 sq. ft. on the first floor and a somewhat larger area on the ground floor, is shortly to be built. The Bursgreen works at Durham are also to be extended to provide additional space for the production of light woodworking machinery.

ADCOCK & SHIPLEY, LTD., Ash Street, report a heavy demand for standard horizontal and vertical milling machines, and radial drilling machines. Bridgeport turret mills, built under licence, are being supplied to many engineering firms, and it is stated that for certain applications these machines are operated at spindle speeds ranging from 650 to 10,000 r.p.m. Home sales of the company's machine tools are maintained at a high level and steady progress has been made in developing export trade with Germany. In this connection it is reported that the company is often able to reduce freight charges by care in the choice of packing, method of transportation, and routes between the works and destinations abroad. The first stage of the building expansion programme has been started, and an extension with a floor area of 25,000 sq. ft. is now under construction on an adjacent site, which is scheduled for further development as and when required.

S. RUSSELL & SONS, LTD., Bath Lane, report active conditions in all departments. The machine tool section is busy with orders for saw sharpening machines and Hydrofeed cold-sawing machines; also high-speed cutting-off machines provided with bar stillages and designed for production runs. The

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This Webster & Bennett type EH boring and turning mill, which is installed in the works of Villiers (Tool Developments), Ltd., Waddens Brook, Wednesfield, Staffs., has a 72 in. diameter table. It is shown set up for machining the 20½-in. bore of a 62-in. diameter gear blank of En.24 steel, which weighs 45 cwt. A good finish is obtained in the bore at a table speed of 30 r.p.m. The 11¼-in. wide peripheral face of the work is machined at 15 r.p.m. with another turret tool

NF 2 cutting-off machine, for example, is suitable for repetition cutting of bars and sections of non-ferrous metals or plastics. Numerous orders are received for special purpose machines and in this category we may note a robust machine for sawing copper billets.

The foundry is well occupied with a wide variety of castings in ductile (spheroidal graphite) iron, also Ni-Resist and Ni-Hard irons. Large quantities of castings for machine tool beds and frames are also made. The structural steel department is still very busy. A new 3-storey office block, which is scheduled for completion during the autumn, is intended to serve as an administrative centre for the various departments of the firm, and will provide some 13,000 sq. ft. of floor space.

FREDERICK POLLARD & CO., LTD., St. Saviour's Road, have a very good order book for their standard ranges of single- and multi-spindle, bench and column type, vertical drilling machines, heavy-duty drilling machines, and radial drilling machines. There is also a sustained demand for special drilling and boring equipment, including high production machines equipped with tooling and fixtures.

PREMIER SCREW & REPETITON CO., LTD., Woodgate, are working to capacity on the production of precision turned and threaded parts from bar stock. Large numbers of screws made of stainless steel, free cutting mild steel, and brass, for example, are regularly produced for the instrument industry. Parts can be machined to A.I.D. and A.R.B. standards and we may note that there has been a steady growth in recent years in this class of work. Petermann Swiss-type automatic machines are widely employed.

EX-CELL-O CORPORATION (ENGLAND), LTD., Hastings Road, are still busy with home and export orders for standard and special fine boring machines. Included in the current building programme is a machine for bore-grinding small ball bearing races in a 12-sec. cycle time, the parts being fed automatically to the work station. The Bryant Centalign grinding head fitted to this machine operates at a spindle speed of 44,000 r.p.m. and is arranged for automatic wheel dressing and feed-back control for size correction. An in-line transfer machine with six machining stations, and two others for flushing and gauging, is being built for turning and fine-boring centrifugally cast wet liners for internal combustion engines. The planned production is 50 liners per hour.

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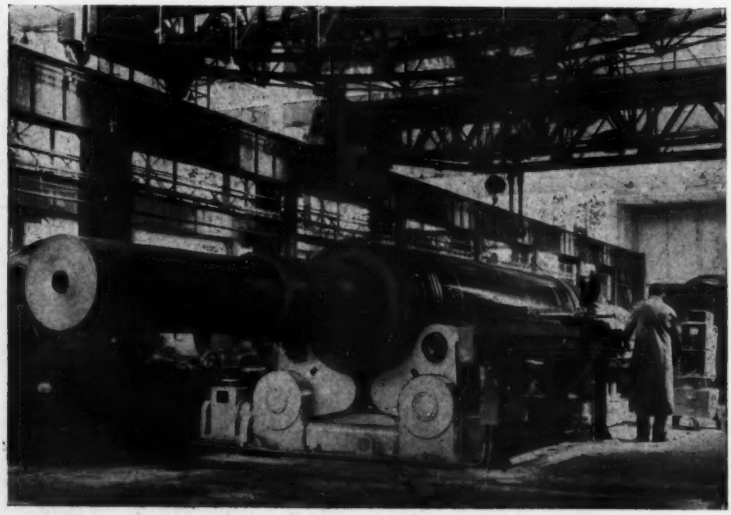
Ultrasonic examination of steel forgings by manual methods has been carried out for some time at the Atlas Works of Thos. Firth & John Brown, Ltd., Sheffield, 4. Recent trends in connection with electric power generation, however, have increased the importance of such tests. Rotor forgings are now larger and heavier, and more highly stressed, and it has become essential to ensure that no defect which could cause failure in service is allowed to pass undetected. For these large forgings manual manipulation is impractical, and the special automatic rotating equipment shown in the illustration has been installed in the heavy machine shops



PERCY MARTIN, LTD., Melton Road, who deal in a wide variety of new and reconditioned machine tools, are still very busy as a result of the sustained heavy demand for centre lathes, drilling machines, grinding machines, and milling machines, also other types of production equipment. This company has other premises at De Montfort Street.

WYVERN MACHINES, LTD., Percy Road, are steadily occupied with the production of 17-in. swing centre lathes, some of which are equipped with copying

attachments; capstan lathes; Wyvomatic automatic duplex turning, facing, and boring machines; and special-purpose Wyvomatic machines, including one with four facing heads, hydraulically-operated tool slides, and pneumatic work clamping. Standard Wyvomatic machines are provided with two spindles, separately driven at speeds up to 3,500 r.p.m., in either direction, by V-belts from 3-h.p. motors. Internal and external profiling facilities are afforded by template-controlled hydraulically-operated copy turning equipment. The vertical tool-slides, which are employed for undercutting, facing, or grooving, may be sequentially controlled.

F. W. HERRIDGE.

Yorkshire

G. ELTHERINGTON & CO., LTD., Burdwell Works, Brockholes, Near Huddersfield, inform us that there has been an increasing volume of business in used machine tools in recent months and that in addition to those from the home market, a number of export orders has recently been received from various countries including India and France. Machine tools at present in stock at the works include a number of Minganti turret lathes.

H. ARMITAGE (MACHINE TOOLS), LTD., Town Top, Kirkheaton, Huddersfield, are maintaining a steady output of all their products. A number of export orders, for example, from New Zealand and Kenya, has recently been received for the company's 4-in. centre bench lathe, and there is a steady call for the 5-in. dividing heads.

Other activities include the production, on a contract basis, of press tools, jigs and fixtures, and special hospital equipment. Several orders are at present in hand for polishing machines for use in metallurgical laboratories.

BROOK MOTORS, LTD., Empress Works, Huddersfield, are busy with the production of all types of electric motors ranging from fractional horsepower sizes up to 650 h.p. Demand for domestic appliance motors has increased in recent months and the control gear manufacturing department reports that a large volume of special control panels is at present on order and in production.

The range of ½- to 40-h.p., D-type, totally enclosed, fan cooled, squirrel cage motors is in good request, and recent developments in this connection have included the introduction of machines of higher horse power.

This company has produced a booklet covering the industrial range of motors, which provides useful information on the various types of units and their applications.

This Fort-Wayne automatic stator winding machine has recently been installed in the Barnsley factory of Brook Motors, Ltd.

A Fort-Wayne automatic stator winding machine, which has been installed in the Barnsley factory, is shown in the illustration.

J. PARKINSON & SONS (SHIPLEY), LTD., Canal Ironworks, Shipley, report an increasing call for their range of machine tools and equipment from customers in both the home and export markets. A large volume of orders is at present in hand for all the milling machines in the company's range and particularly for the vertical types. Orders for Sunderland gear planers are also satisfactory, and a considerable percentage relates to machines of the larger sizes.

Demand for cutters for use with the Sunderland gear planers is continually increasing, and we are informed that business in vices is also expanding at a satisfactory rate.

The company has recently installed a number of new machine tools, including a Churchill internal grinder, and a Wadkin, articulated arm, high speed milling machine, also a Delapena induction hardening machine.

JOHN ROBSON (SHIPLEY), LTD., Ives Street, Shipley, inform us that their range of horizontal diesel engines, in sizes from 11 to 150 h.p., is still in good demand, orders at present in hand being almost entirely for export to various countries,

including Iran, Syria, Jordan, Burma, and Pakistan.

We understand that a prototype 4-cylinder, 100 h.p., vertical type diesel engine is at present undergoing tests. A Kitchen-Walker E.2. 4-ft. radial drilling machine has recently been installed in the works.

W. B. & U. ATKINSON, LTD., Rosse Street Works, Shipley, are busy with the production of all types of textile machinery components, including tensioning units and thread guides. A large order has recently been received for equipment for export to the U.S.S.R., also an order from New Zealand. To meet the increasing demand for these products, the company has installed a number of special purpose machines in recent months.

FRANK WIGGLESWORTH & CO., LTD., Saltaire, Shipley, inform us that the call for their many products is maintained at a high level. A good volume of orders is at present in hand for the company's power transmission equipment, which includes Texrope V-belts and pulleys, mechanically operated clutches of both ring and multi-disc high speed types, centrifugal clutches, and flexible couplings. The foundry is well occupied with the production of the various castings required for these products.

R. SUTCLIFFE.

The South

VISUAL PLANNING SYSTEMS, LTD., Athlon Road, Alperton, Middlesex, have specialized since 1945 in the construction of scale models for factory and plant planning, whereby a sense of realism is conveyed by the 3-dimensional presentation of proposed machine tool layouts, production lines, and processing equipment, for example. Many large firms, and various Government Departments and educational authorities, have been supplied with simple or elaborate models in which details of door and window openings, partitioning benches, conveyors and machine tools have been reproduced to a scale of either ¼ in. or ⅜ in. to 1 ft.

The wide range of models available from stock or at short notice covers most of the machine tools built during recent years by British, American and European manufacturers. Special models, for example of transfer machines, can be provided if required, and we may note that such an item was included in a layout depicting the proposed arrangement of some 800 machine tools in a new factory which is to be employed for the production of automobile transmission equipment. Larger models of machine tools, to a scale of 1½ in. to 1 ft., are made for display at exhibitions and for other sales promotion purposes.

Another activity of this company is the production of castings to close tolerances in LM 6, LM 8, LM 11, LM 15, WP and DTD 5008 light alloys. A speciality is the casting of thin blading and shrouded impellers, also waveguides in LM 4 alloy by a special process which, it is stated, enables dimensional limits of ±0·002 in. to be maintained.

A wide variety of machine tools (such as Wadkin and Bridgeport vertical millers) which are specially suitable for the accurate machining of non-ferrous components is employed in the works and Hauser jig boring machines are installed under controlled conditions.

A growing demand is reported for the reclamation service provided for the removal of broken taps and twist drills from machined parts with a Marbaix M 58C disintegrator.

METCO, LTD., Chobham, Woking, Surrey (formerly Metallizing Equipment Co., Ltd.), are experiencing a good demand for flame spraying equipment and associated materials to be employed in connection with their three methods of applying metal or ceramic coatings to a wide variety of parts.

The original process for the spraying of metals from a gun fed with wire is widely employed, but two additional methods of deposition, known by the registered trade marks Thermo-Spray and the METCO Plasma Flame Spray, are now being applied on an increasing scale. With the former method, coatings are built up from non-oxidizing materials in a powdered state, oxy-acetylene or other gas mixtures being employed as melting and propelling agents, whereas with the latter an electric arc shrouded by an inert gas provides zones with temperatures stated to be as high as 16,650 deg. C., to vaporize powdered materials such as aluminium oxide, cobalt, tungsten, and titanium oxide.

The range of materials that can be sprayed is steadily being extended, and we may note, for example, that cermet coatings are being applied to components that are subjected to blast erosion and chemical corrosion. Applications of flame spraying that are now well established include the coating of rocket nozzles and nose cones; vacuum tubes; high melting range crucibles; plug gauges; turbine shafts; crankshaft; and steel structures. To afford a complete service to users and potentional users of flame spray equipment, increased demonstration, training, warehouse and office facilities have recently been provided, and the next stage of the factory expansion is well under way.

BARRON & CROWTHER, LTD., Eastleigh, Hants., are extending their works and are to install additional equipment to provide improved facilities for building the well-known Barcro range of wire drawing machines. Barcro type BB machines, introduced ten years ago, are widely employed in this country and other parts of the world for drawing wires of ferrous and non-ferrous metals, including stainless steels, nickel chromium steels, carbon steels, Monel metal, aluminium and its alloys, copper, and brass. More than 1,000 of these machines are reported to be in operation, and numerous orders are in hand. Installations have been provided for producing wire in coils or spools at finishing speeds, for small diameters, of 3,000 to 3,500 ft. per min.

Barcro machines provided with 2-tiered BB drawing blocks, which prevent axial twisting of the wire and enable finished coils to be removed while wire is accumulating, are built in four sizes and each may be equipped with any number of blocks, as required. In the accompanying illustration is shown an 8-die composite machine which accepts 5 s.w.g. or 8 s.w.g. steel wire and reduces it to minimum diameters of 0·072 in. and 0·053 in. respectively. Seven 30-h.p. fixed-speed motors and one 35-h.p. variable-speed motor are employed for driving the drawing blocks of this machine.

F. W. HERRIDGE.

Composite wire drawing machine designed and built by Barron & Crowther, Ltd., Eastleigh, Hants.

Activities of Burnley Aircraft Products

Burnley Aircraft Products, Ltd., Fulledge Works, Burnley, Lancashire, inform us that the section of their works concerned with the production of aircraft components and gas turbine combustion equipment is at present extremely busy. The many activities include the fabrication of stainless steel and Nimonic components for gas turbine exhaust units and piping, and the fabrication of components from heat resistant metals, for use in nuclear power plants.

In the metal spraying department equipment is installed for the application of aluminium, copper, zinc, cadmium, nickel, molybdenum, and steel, also a number of shot blasting machines of various capacities. Other equipment provided includes a number of spark erosion machines which are employed for various duties. At one set-up on such a machine, 12 slots 0·025-in. wide, and 12 holes of $\frac{1}{16}$ in. diameter, are produced in a Nimonic 80 component approximately $\frac{1}{8}$ in. thick, the operation being completed in 35 min.

Among machine tools and equipment recently added to the plant may be mentioned a Denham S.R.10.V. centre lathe designed for machining Nimonic; a Churchill cylindrical grinder; and an automatic seam welder for producing large diameter cylinders. This latter machine was built in the company's works and the automatic control gear was supplied by F. Hirchmann, London.

Universal Boilers, a subsidiary of Burnley Aircraft Products, make all types of road tankers. They also undertake maintenance of tankers, and offer a heavy fabricating service, on a contract basis, to the engineering industry. To meet increasing demands for this service the department will shortly be moved to larger factory premises at Ormskirk, Lancashire.

Another subsidiary, Solar Weld Languepin, Ltd., produces and markets B.A.P. Pneustroke resistance welding machines and equipment. Standard machines up to 70 kVA., and special-purpose machines up to 100 kVA. rating are at present being built. In addition, the company acts as sales agent for the United Kingdom for the larger resistance welding machines made by La Soudure Electrique Languepin, of Paris.

Solar Weld Languepin also supply small special-purpose, multi-head,

transfer type welding machines which are individually designed to customers' requirements. In addition, a section of the works is constantly occupied with the conversion and repair of all types and makes of special-duty welding machines.

This company recently obtained the United Kingdom sales agency for the range of spark erosion machines made by La Soudure Electrique Languepin, and in view of the great interest that has been shown by various branches of the engineering industry, production of these machines has now been started at the Burnley works.

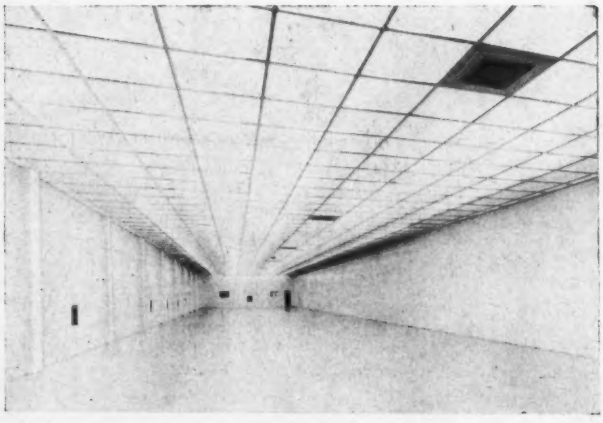
A section of the works has been converted into a demonstration department in which spark erosion machines are shown to prospective customers, and technical assistance is given in connection with the production of particular workpieces by the spark machining process.

Large Pressurized Clean Room

What is believed to be the largest pressurized "clean section" in the country is approaching completion at the Stockport, Cheshire, premises of Fairey Engineering, Ltd., a member company of the Fairey Group. The clean section, which is in two parts, has an area of 19,000 sq. ft., and, together with the changing rooms and special canteen room, is provided with an Isora, airtight, translucent ceiling, supplied by Isora Illuminated Ceilings, Ltd., Bedford Avenue, Slough.

This ceiling comprises a light steel grid, suspended from the roof trusses of the building, and translucent panels, which are individually clipped down on to plastics sealing strips. Apart from preventing the ingress of dirt, the ceiling will substantially reduce heat losses.

The clean section will be employed by Fairey Engineering for the final assembly of control rod units and burst slug detection gear for the nuclear power station which is being built at Trawsfynydd, North Wales, by Atomic Power Constructions, Ltd.



A view of the new "clean section" for assembly of atomic power station equipment at the works of Fairey Engineering, Ltd.

Overseas Trade in Metal Products

(*Continued from page* 291)

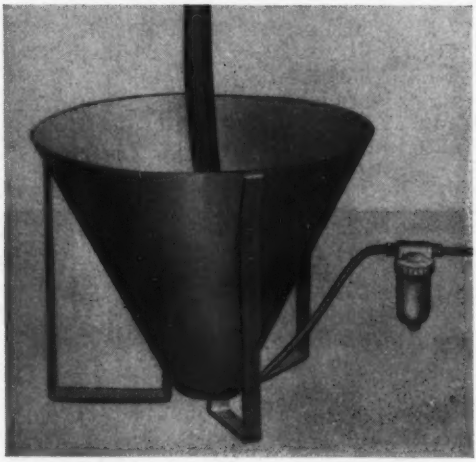
in export markets have been partially offset by falls in other directions. For example, the value of exports of "coal, coke and briquettes" dropped from £62·4 million in 1956, to £14·1 million (annual rate £28·2 million) in the first half of 1961, and the value of "cotton yarns and woven fabrics" from £88·7 million to £30·9 million (annual rate £61·8 million). Obviously, however, adverse movements on this scale cannot continue indefinitely, and it appears that if the rate of expansion of exports of metals and metal products can be sustained, a more satisfactory overall growth of export trade can be anticipated in the future.

On the other hand, if exports of metal products on the scale envisaged are to be achieved within the next decade, and the requirements of the home market simultaneously satisfied, both the capacity and the productivity of the metal working industries generally must be increased more rapidly than in the past. Clearly, a much larger output of machine tools will be necessary, and, at the same time, further improvements in accuracy and productivity must be sought. It seems essential, therefore, that no efforts should be spared to improve facilities for machine tool research and development, both nationally and on the part of the builders of such equipment, and that the Government should adopt a more enlightened fiscal policy in order to encourage the installation of new plant, of higher potential output, on the widest possible scale.

ELECTRICITY OUTPUT CAPACITY for public supply in Great Britain had increased to 30,208 megawatts at the end of May, new plant of 320 megawatts having been brought into commission during the period. At the end of 1960, the capacity was 29,575 megawatts.

Amigo Hopper Feed Unit

To facilitate loading and topping-up of overhead feed hoppers, Amigo Machine Co., Ltd., Skylon House, Park Royal Road, London, N.W.10, have introduced the simple unit shown in the accompanying illustration. It is applicable to any granulated and free-flowing powder, and was originally developed by the company for use on their blow-moulding equipment.



Amigo hopper feed unit which is operated by compressed air

As may be seen, the unit comprises a container which can be placed on the floor or at any convenient point for accepting raw material from a bulk source. This container is connected by a large-bore flexible tube to the hopper on the machine to be served. Air at a pressure of about 60 lb. per sq. in. is fed into the bore of the flexible tube by way of a pipe which enters the base of the container. The air nozzle arrangement is such that the material is carried upwards in the air stream, and it is stated that lifts up to 7 ft. can be obtained, the capacity depending upon the air speed.

THE TOTAL EXPORTS OF MACHINERY of all types (other than electric) during the first six months of this year were valued at £419,007,990, as compared with £365,368,341 for the same period in 1960. Of this total £27,429,863 went to Australia, £26,739,388 to Canada, and £24,271,299 to the U.S.A.

Machine Tool Exports and Imports

EXPORTS OF MACHINE TOOLS

Type of Machine	Month ended May 31, 1961	Five months ended May 31	
		1960	1961
	Value £	Value £	Value £
New, complete:—			
Bar and chucking automatics	91,044	313,479	507,764
Boring machines:			
Vertical	41,321	181,058	533,025
Other	90,149	689,752	451,444
Drilling machines	104,076	616,509	643,290
Gear-cutting machines	116,109	453,011	418,020
Grinding, lapping and honing machines	234,610	1,163,526	1,470,168
Lathes:			
Capstan and turret	242,949	839,258	1,344,256
Other	351,262	1,698,111	1,870,402
Milling machines	184,101	858,498	1,179,147
Planing machines	29,505	100,332	174,979
Presses:			
Hydraulic	62,045	723,913	407,098
Other	96,202	765,896	583,756
Punching and shearing machines	48,401	249,947	346,714
Other plate and sheet-metal working machines, including straightening rolls	31,789	302,940	317,075
Screwing and threading machines	71,026	327,017	414,691
Shaping and Slotting machines	15,975	174,616	196,968
All other machines	262,923	1,016,427	1,515,745
Used, complete	75,002	479,439	366,415
Parts	329,851	1,270,697	1,831,642
Total	2,478,340	12,224,426	14,572,599
Destination			
Union of South Africa	123,140	509,490	702,887
India	257,272	1,475,578	2,082,035
Australia	331,801	2,758,968	2,114,213
New Zealand	54,036	187,941	359,970
Canada	124,323	580,859	678,477
Other Commonwealth countries	121,037	690,815	831,720
Soviet Union	63,047	198,651	466,384
Sweden	98,772	259,343	513,176
Western Germany	151,631	354,796	760,784
Netherlands	50,787	224,989	375,950
France	142,242	704,327	636,698
Spain	106,156	223,658	406,589
Italy	228,437	305,556	999,448
United States of America	140,162	1,175,391	556,478
Other foreign countries	485,497	2,574,064	3,087,790

IMPORTS OF MACHINE TOOLS

New, complete:—			
Bar and chucking automatics	77,414	241,228	393,652
Boring machines	160,137	634,314	653,093
Drilling machines	24,165	107,470	180,204
Gear-cutting machines	128,434	311,234	1,092,144
Grinding, lapping and honing machines	377,655	1,514,184	2,149,521
Lathes	233,334	803,131	1,422,189
Milling machines	313,095	1,178,600	1,324,929
Planing, shaping and slotting machines	58,409	167,555	300,234
Presses	154,015	456,820	822,161
All other machines	506,645	1,480,735	2,673,617
Used machines, complete	91,515	450,363	387,455
Parts	320,480	1,249,864	1,574,208
Total	2,445,298	8,595,498	12,973,407
Country of Origin			
Western Germany	780,396	2,364,959	3,552,587
Switzerland	287,093	1,268,226	1,410,460
US America	904,822	3,311,862	5,485,019
Other countries	472,987	1,650,451	2,525,341

Books Received

B.E.A. Classified Handbook of Members, 1961. The British Engineers' Association, 32 Victoria Street, London, S.W.1. 608 pp. [Price 21s.]

Now in its 32nd edition, this handbook includes notes on the objects and activities of the Association and the information service which is offered; a alphabetical list of members with full names, addresses, telephone numbers, telegraphic addresses, and particulars of products; a section devoted to members' announcements; a classified list of members' products under more than 3,000 headings; and a section devoted to trade names and marks. There are indexes to the classified list of products in French, German, Spanish, and Portuguese.

Directory of Opportunities for Qualified Men, 1961 edition. By Clive Labovitch, M.A. Cornmarket Press, Ltd., Darley House, 1 Lower James Street, London, W.1. 155 pp. [Price 8s. 6d., or 5s. with paper cover.]

Opportunities and prospects offered to qualified men and women by 140 industrial and commercial organizations, and Government Departments, are here set out in detail. A classified index summarises information about the size of the organizations, whether men or women are employed, and the areas where employment is offered. Another index refers men and women with various qualifications to the particular organizations which require recruits in these categories. The directory also contains an extensive list of continuation educational courses, and an editorial section includes articles which give a broad picture of the employment situation for qualified men and women. It may be noted that amongst the industrial companies to which reference is made, the highest demand is for mechanical engineers.

National Standards Laboratory, C.S.I.R.O., Division of Metrology—Annual Report 1959-60. University Grounds, City Road, Chippendale, Sydney, N.S.W., Australia. 38 pp.

This report is concerned with the work of the following sections of the Laboratory: length; mass; interferometry; electronics; and applied mechanics, covering vibration, engineering design analysis, and machining research. There is a list of papers published by members of the staff in various technical journals. Reference is made to developments in air gauging which have resulted from industrial enquiries for a non-contact method for measuring the thickness of materials such as rubber and asbestos cement. In the electronics section, a fringe counting apparatus and a line setting device are being developed, also semi-automatic gauging equipment for measuring variations in the size and position of drilled holes. In the vibration section the main activity has been the theoretical study of large seismic mountings.

Metal Industry Handbook and Directory, 1961. Published for *Metal Industry* by Iliffe Books, Ltd., Dorset House, Stamford Street, London, S.E.1. 560 pp. [Price 22s. 9d., postage paid.]

Section I of this handbook is concerned with general properties of metals, and contains much useful information under such sub-headings as: particulars of the metals, contraction of castings, specific resistance of alloys, copper and its alloys, mechanical properties of zinc die casting alloys, tempering metals, silver brazing alloys, white metal bearing alloys, British Standard Specifications, and standard classifications for non-ferrous scrap metals. The second section is devoted to general data and tables, and the third to electroplating and allied processes.

Finally, there is a directory section which incorporates a list of trade names; particulars of metal and allied trades associations and societies and of scientific and technical institutions; a classified list of products for buyers; and a list of addresses and telephone numbers of firms whose names are included in the guide.

Spring Design. By W. R. Berry, Ph.D., M.Sc., M.I.Mech.E., F.R.I.C., F.I.M. Emmott & Co., Ltd., 31 King Street, West, Manchester. 327 pp. [Price 40s. 0d. net.]

To design the best spring for a given duty by conventional methods is far from easy, since a number of initial assumptions must be made. Many of the design difficulties have been overcome by the author by means of nomograms, and, generally, the book describes an approach to the subject that is original and thorough.

Practically all forms of spring are considered in some detail, including coiled tension and compression, conical, volute, cantilever, laminated, disc, and ring types, also axially-loaded springs of rectangular material, bent-wire springs, shaped springs of flat material, flat spiral springs, and gramophone springs.

Nests of springs, torsion bars, fatigue conditions, material for springs, design for fluctuating and cyclic loads, shot peening, and static and dynamic loading are also discussed.

The comprehensiveness of the work and the practical outlook of the author should appeal to all designers concerned with springs.

A Guide to Arc Welding Electrodes. The British Electrical and Allied Manufacturers' Association (Inc.), 36 Kingsway, London, W.C.2. 96 pp. [Price 5s. net.]

In connection with the issue of a revised (6th) edition of this guide, which was first published in 1944, it is pointed out that notable technical advances in engineering construction have been made possible by welding techniques, notably in the construction of nuclear power equipment, and that with greater specialization there is a growing demand for information on electrodes.

Classified lists of British electrodes are conveniently presented, together with a key to British and American electrode standards. In addition, to assist users in their choice of electrodes for particular applications, there is a brief description of the British classification of electrodes, published by the B.S.I. as B.S.1719:1951. A more complete description of the American method of classifying electrodes is also given, and equivalent American code numbers are shown in all the classified lists. In a separate section, information is given on special electrodes, for example, for welding such materials as non-ferrous metals, cast iron, and corrosion resistant steels, and there are lists of such electrodes.

Trade Publications

PRECISION CHAINS, LTD., Clayton Lane, Manchester 11. Folder Ref. 53/0 listing steel conveyor roller chains, chain wheels and attachments. Chains with pitches from 2 to 24 in. are available, and with breaking loads up to 85,000 lb.

THE INCANDESCENT HEAT CO., LTD., Smethwick. Leaflet drawing attention to the range of foundry plant made by the company in association with The Whiting Corporation of America. Numerous installations of Whiting dust arresters on cupolas are illustrated.

WILD-BARFIELD ELECTRIC FURNACES, LTD., Otterspool Way, Watford By-Pass, Watford, Herts. Illustrated leaflet describing the 4-kW sealed quench slipper furnace, for clean hardening small components under controlled conditions. The slipper is 4-in. wide by 6-in. long, and the 12- by 26- by 20-in. deep quench tank is equipped with an agitator and a heater. The maximum operating temperature is 950 deg. C.

BRANSON ULTRASONIC CORPORATION, 37 Brown House Road, Stamford, Connecticut, U.S.A. Booklet of 14 pages entitled "Chemicals for Ultrasonic Cleaning," providing much useful information on the chemicals most commonly used for the purpose, their applications, and cleaning procedures. Fourteen different types of media, including aqueous solutions and solvents, are listed. The company is represented in this country by Dawe Instruments, Ltd., 99 Uxbridge Road, London, W.5.

THE PYRENE CO., LTD., Metal Finishing Division, Great West Road, Brentford, Middlesex. Leaflet describing the functions and methods of application of Preperite No. 1, and Preperite No. 3, for the removal of rust from ferrous, and other corrosion products from non-ferrous materials. Information is also included on Paste Preperite for local rust removal and Pyroclean No. 201 for removing scale and sludge from heating coils in Bonderizing and Parkerizing plants.

MICROMETRICAL MFG. CO., Ann Arbor, Michigan, U.S.A. (Gaston E. Marbaix, Ltd., Devonshire House, Vicarage Crescent, London, S.W.11). Informative 8-page brochure describing the Proficorder electro-mechanical instrument for measuring and recording roundness, flatness and roughness. Applications are shown of the basic units provided for measuring flat, round, and internal surfaces. Vertical magnifications up to 50,000×, and longitudinal magnifications up to 500× can be obtained.

HADFIELDS, LTD., East Hecla Works, Sheffield, 9. Publication No. 463 is concerned with "fine steels" in the form of billets, bars, slabs, and forgings, for automobile and general engineering purposes. Sections are devoted, for example, to research, melting plant, rolling mills, quality control, and forged products. In addition there are tables showing the forms in which the various steels are supplied, brand numbers with equivalent En. numbers, and compositions and properties of case-hardening and structural and general engineering steels.

B. DRAPER & SON, LTD., Kingston Hall Road, Kingston-upon-Thames, Surrey. Illustrated catalogue of 24 pages, concerned with Metabo electric and hand tools made in West Germany, for which the company are sole agents in this country. Tools listed include hand and electric drilling and grinding machines; bench grinders; a combined polishing head, grinder and saw bench; impact grooving and drilling machines; orbital sanders; and portable electric saws.

STUART DAVIS, LTD., Stonebridge Highway, Willenhall, Coventry. Fully illustrated and well-presented catalogue covering the range of Red Ring air equipment. The opening section is devoted to cylinders, cylinder mountings, and hydro-pneumatic variable speed units, and includes specifications and useful general information. In the section on control valves, which follows, numerous types are covered, including 5-port valves arranged for various methods of operation; pilot or master valves; 2- and 3-port pilot valves; pressure release valves; and air flow regulators. Various air-line accessories are also listed.

IMPERIAL CHEMICAL INDUSTRIES, LTD., Nobel Division, Silicones Department, Stevenston, Ayrshire. Publication giving useful application data for Silcoset silicone rubbers. Product data sheets have also been issued for two additional Silcoset rubbers which have been added to the range. Silcoset 103 is a white solvent-free paste which cures at room temperature to a resilient silicone rubber after addition of the appropriate curing agent. Silcoset 104 is thixotropic and can be effectively applied from a caulking gun. It can be readily bonded to primed metal surfaces, and is intended for sealing, patching, and caulking.

LONDEX, LTD., 207 Anerley Road, London, S.E.20. Illustrated list No. 190 describing the recently-introduced Londex type TY electronic timers, which are available with five time ranges from 4 to 120, 2 to 60, 1 to 30, 0·5 to 15, and 0·25 to 7·5 sec. The principal components comprise a multi-tapped input transformer, a thyratron, a timing condenser and resistance, and two Londex relays. Wall mounting or flush mounting instruments can be supplied. The setting accuracy is ±5 per cent of any given setting, or ±0·06 sec., whichever is the greater. A selector gives a choice of three different contact sequences.

HACKBRIDGE & HEWITTIC ELECTRIC CO., LTD., Walton-on-Thames, Surrey. Well-illustrated 24-page catalogue, No. DB5/6, giving details of the construction of large Hackbridge power transformers with both natural and artificial cooling. Separate sections are devoted, for example, to cooling arrangements, cores, windings, tappings, tanks and fittings, temperature indication and control, and testing. Another well-produced catalogue, No. 193/2, is concerned with the applications of Hewittic silicon and germanium rectifiers for electrolytic processing, traction, and light and power supplies. Typical rectifiers are illustrated, and information is included on electrical connections, the choice of germanium or silicon, cooling arrangements, and basic layouts.

Industrial Notes

J. C. Neville, Ltd., 34 Priests Bridge, London, S.W.14, have been appointed sole agents for the United Kingdom for the Rast expander for copper tube.

Circuit Motors, Ltd., High Road, London, N.15, are the sole agents in the United Kingdom for the Cko-Motakov (Czechoslovakian) range of portable electric tools.

Shaw Processes, Ltd., 25 Clyde Vale, Forest Hill, London, S.E.23, announce the formation of Shaw Processes (India) Pvte., Ltd., at Faridabad, New Delhi, in conjunction with Electronics, Ltd., of the same address.

Winstanley (Die Sets), Ltd., Pershore, Worcestershire, inform us that to meet growing demand they have augmented their die set manufacturing capacity, and have increased the labour force substantially.

Midland Silicones, Ltd.—The address of the Birmingham sales office of this company is now Lichfield House, Smallbrook, Ringway, Birmingham, 5. Areas covered by this office comprise the Midlands, South Wales, and the South West.

An Auction Sale of Machine Tools and miscellaneous stores will be held at the W.D. Storage Depot, Rotherway, Hereford, on August 15. The auctioneers will be Russell, Baldwin & Bright (Dept. C), 20 King Street, Hereford.

The Institute of Work Study, 3 Cork Street, London, W.1, will hold their annual conference at The College of Aeronautics, Cranfield, from September 29 to October 1. The theme will be "The Scope for Investigation into Office and Sales Procedures." Further particulars can be obtained from the above address.

Vacuum Research (Cambridge), Ltd., Quayside, Bridge Street, Cambridge, inform us that they have received a repeat order for a Camvac metallizer from Metalon A.B., Kavlinge, Sweden. This compact reel-in-chamber high vacuum metallizer will be used for the production of aluminium-coated capacitor tape.

The 2nd International Pipes, Pipelines, Pumps and Valves Exhibition and Convention will be held at Earls Court, London, from April 9 to 13, 1962. Full particulars can be obtained from the organizers, Scientific Surveys, Ltd., Exhibition Division, 97 Old Brompton Road, S.W.7.

Conference on Creep and Fracture.—A joint international conference on creep and fracture will be held in New York from August 25-28, 1963, and in London during October, 1963. The sponsors are the American Society of Mechanical Engineers, the American Society for Testing Materials, and the Institution of Mechanical Engineers, 1 Birdcage Walk, Westminster, London, S.W.1, from whom full particulars can be obtained.

F. Pratt Engineering Corporation, Ltd., is the title under which F. Pratt & Co., Ltd., has been re-constituted as a holding company. A new wholly-owned subsidiary, F. Pratt & Co., Ltd., has been formed to carry on the manufacture and marketing of the company's products, and the business will be continued under that name. The address, as hitherto, is Halifax, Yorks.

Kimberly-Clark, Ltd., Larkfield, Maidstone, Kent, are now marketing their Kimwipe disposable wipers in roll form. Of 2-ply construction these wipers are made from soft but strong cellulose, and are intended for the heavier cleaning operations involving the removal of oils, grease, dirt, and solvents. A roll comprises 100 sheets measuring 20 by 18 in. and is perforated.

Russian Translating Programme. A folder issued by the National Lending Library for Science and Technology, Boston Spa, Yorkshire, gives titles and subscription rates for English translations of 17 Russian technical journals. A list of Russian technical books which have been translated and published is also included. Particulars of many other translations which can be purchased or obtained on loan are available from the above address.

Technic Design Services Co., Ltd., 891 Pershore Road, Selly Park, Birmingham 29, have recently acquired the Northfield Tool Co., Ltd., South Birmingham. The manufacturing facilities of the latter firm will supplement the services of the other members of the group—namely, Technic Electrics (Birmingham), Ltd., and Viewdy Investments—and will enable the group to offer a complete consulting, design, and production service in connection with machines, fixtures, and tooling equipment.

Schloemann, AG., 13 Steinstrasse, Düsseldorf, Western Germany, who for many years have built machinery and plant for the plastic shaping of ferrous and non-ferrous metals, have extended their production programme to include twin screw extruders and injection moulding machines for plastics. The latter machines, of the heavy-duty type, have been developed in conjunction with Albert Stübbe, Vlotho an der Weser, and can be supplied with shot capacities up to 13¼ lb.

C. A. Parsons & Co., Ltd., Heaton Works, Newcastle upon Tyne, have signed a licence agreement with Zallea Brothers, Delaware, U.S.A., for the manufacture and sale of thinwall-bellows expansion joints of Zallea design. The agreement provides for the marketing of the British-made products in the United Kingdom, the European Free Trade Area, and British Commonwealth (with the exception of Canada). These joints are used to absorb movement in a wide range of piping applications particularly in the oil and chemical industries.

The Lapointe Machine Tool Co., Ltd., Otterspool, Watford By-Pass, Watford, Herts., have provided an additional 1,000 sq. ft. of shop area, which has enabled the broach regrinding facilities to be enlarged and improved. As a result it has been possible to reduce the average regrinding time from three weeks to less than a fortnight. It is stated that by efficient planning it is hoped to reduce the time still more. This development forms part of a general expansion programme which is scheduled for completion in September.

LANCING MACHINE TOOLS, LTD., Commerce Way, Lancing, Sussex, have been appointed agents for the range of plate, sheet, tube, and section working machinery built by Boldrini, S.P.A., Italy. This range includes pyramid type plate bending rolls of capacities up to 20 ft. 2 in. by 1½ in.; initial pinch type bending rolls up to 14 ft. 2 in. by 2½ in.; shipyard rolls up to 40 ft. by 2⅜ in.; straightening rolls; tube and section bending rolls; friction screw presses for dishing ends up to 19 ft. diameter by 2 in. thick; and rotary cold flanging machines.

DAVID BROWN INDUSTRIES, LTD., inform us that a turbine reduction helical gear unit which was supplied in 1929 to the D.P. Battery Co., Ltd., Bakewell, by Park Works, Huddersfield, has been withdrawn from service because the generating plant is no longer to be operated. During a period of more than 30 years the gear unit has required no attention although the plant has been run continuously with only short breaks for routine inspection at holiday times. The unit has been employed to transmit drive from a 225 kW. turbine with a reduction from 7,000 to 1,000 r.p.m. at 12-in. centres.

THE CAMP BIRD GROUP of companies announce that production of cold forging plant has been started in a new £500,000 factory by Saarländische Werkzeug und Maschinenfabrik, Walther Nothelfer G.m.b.H., at Lockweiler, between Saarbrücken and Trier, Western Germany. In addition to the construction of cold forging equipment for sale, a complete cold forging installation will be kept in production to enable customers' plant to be proved under operating conditions. The operating company is a member of the International Cold Forging Group and is thus associated with Cold Forging, Ltd., 29 Hanworth Road, Sunbury-on-Thames, Middlesex.

CLYDE WILLIAMS CORPORATION has been formed by Dr. Clyde Williams and his American and European business associates. The headquarters are at 50 West Gay Street, Columbus, 15, Ohio, U.S.A., and there will be branch offices in London and Paris. One of the main purposes of the company will be to provide liaison between European and American technology. In this connection it is pointed out that although great progress is being made on both sides of the Atlantic, arrangements for communication and integration of technological developments have sometimes been inadequate in the past. For this reason it is planned to hasten the process of information dissemination "as it relates to research and technology, to markets for products, and to finance and investments."

MATERIALS HANDLING EQUIPMENT (GREAT BRITAIN), LTD., 40a Dover Street, London, W.1, inform us that the parent company Hunslet (Holdings), Ltd., is to allocate greater facilities to meet the growing home and export demand for their products which include Kestrel and Falcon side-operating fork-lift carriers, and Lizard electric reach trucks, and to provide for further development of existing and additional models. From August 14, production and key employees will be transferred from Maidenhead to the much larger works of the Hunslet Engine Co., at Jack Lane, Leeds. The London and Maidenhead offices will be merged and from August 21 will be located with those of the Hunslet Group in Locomotive House, 30-34 Buckingham Gate, S.W.1.

William Whiteley & Sons

Alfred Herbert, Ltd., Coventry, have acquired the whole of the issued share capital of William Whiteley & Sons, Ltd., Huddersfield. The former company has acted as selling agent for Planers planing machines for some years with the result that there has been an increasingly close association between the organizations. It was therefore decided that it would be in the interests of both if production and selling were integrated. Mr. J. Charlesworth will still hold the positions of director and general manager and production in Huddersfield will be continued and expanded.

Personal

DR. W. J. GIBBS, M.I.E.E., has relinquished his appointment as manager of the engineering mathematics department, Associated Electrical Industries (Rugby), Ltd., Rugby, but remains as a group company consultant. He has been succeeded by MR. N. KERRUISH, M.A., A.M.I.E.E.

DR. SYDNEY JONES has joined R. B. Pullin & Co., Ltd., Great West Road, Brentford, Middlesex, as technical director. Until recently he was Director of Research Applications at the Central Electricity Board, where he was responsible for the development of research projects, in particular, the development of automatic process control systems.

MR. W. N. COLLINS, M.I.Mech.E., who will reach retirement age early in 1962, has resigned from the position of assistant managing director of F. Perkins, Ltd., Peterborough, and from the company's board and the boards of its subsidiary companies. It is not intended that his connection with the Group should be entirely severed immediately, but his duties will be gradually lightened.

DR. B. L. GOODLET has retired from the position of managing director of Brush Electrical Engineering Co., Ltd., Loughborough, because of ill health, but will continue with the company as vice-chairman. He is succeeded by MR. JAMES EDWARD SMITH, M.I.Marine Eng., formerly managing director of the National Gas & Oil Engine Co., Ltd., Ashton-under-Lyne, and a director of Hawker Siddeley Industries.

Mr. R. B. DEW, assistant managing-director of Production Engineering, Ltd., has been appointed visiting professor in industrial administration at Manchester University. It is stated that this post is the first of its kind at any British university. The Department of Industrial Administration of the College of Science and Technology was established in 1918, and the first professor, Mr. R. W. REVANS, who is now being joined by Prof. Dew, was appointed in 1955.

The following new appointments have been announced:—

MR. O. E. TRIVETT, A.M.I.Prod.E., A.M.I.E.E., as general manager of Gamet Products, Ltd., Colchester, a member company of the 600 Group.

MR. F. J. EVEREST, M.Sc., M.I.Mech.E., as director and general manager of Stein Atkinson Vickers Hydraulics, Ltd., 197 Knightsbridge, London, S.W.7.

MR. C. J. POWERS as assistant manager of the contracts division of the industrial department of York Shipley, Ltd., North Circular Road, London, N.W.2.

MR. F. J. SULLIVAN, as a director of Turbine Gears, Ltd., Cheadle Heath, Stockport. He was previously commercial manager of the company.

MR. D. J. BARROW, formerly contracts supervisor for Tank Linings, Ltd., Droitwich, as production engineer of Winstanley (Die Sets), Ltd., Pershore, Worcestershire.

MR. H. ANDREWS, as secretary and MR. H. L. HUDSON as chief accountant of Wickman, Ltd., Banner Lane, Coventry, following the appointment of Mr. H. B. Morris to the board of directors.

MR. BERNARD FELTBOWER as chief engineer of the Control Gear Division of the English Electric Co., Ltd., at Kidsgrove, Stoke-on-Trent. He joined the company at the beginning of July.

MR. IAN D. MCDONALD, technical representative of Angus & Crichton (Sales) Ltd., 7 Midland Street, Glasgow, C.1, as a director of the company, the sole representatives in Scotland for Elgar Machine Tool Co., Ltd., Press & Shear Machinery Co., Ltd., and Gate Machinery Co., Ltd.

Rockwell Board Appointments

Mr. J. M. Brice, M.I.Prod.E., Mr. H. A. Chambers, M.I.Prod.E., and Mr. H. Rockwell, B.Sc., A.M.I.Mech.E., have been appointed directors of Rockwell Machine Tool Co., Ltd., Welsh Harp, Edgware Road, N.W.2.

Scrap Metals

MIDLANDS.—When the local factories closed for holidays on July 29, trading was practically suspended for the next two to three weeks as practically all consuming works were affected.

The few exceptions include customers for cast iron scrap and bushy turnings. In particular, cylinder cast iron scrap can be delivered to foundries which are accepting material over the holiday period, to obtain increased supplies.

Prices for chipped steel turnings have fallen by a further 10s. per ton for delivery to some blast furnaces and it is unlikely that deliveries can be resumed on a reasonable scale before August 21.

The situation as regards cast iron borings appears to be firm, and odd loads are being moved during the holiday period to chemical works in other areas.

During the interval, merchants will be carrying out plant repairs and making space in their yards to accept deliveries after the holidays, and it is expected that several grades of bundles and other scrap will have to be stocked pending the re-opening of markets.

In general, it is a difficult time for merchants, who are committed to accept scrap that is arising, at contract prices, while consumers are out of the market for periods varying from 2-4 weeks. It is not easy to be optimistic as regards demand for scrap over the next few weeks and prices offered by merchants for the occasional amounts of "difficult" grades will therefore be lower than usual.

New Companies Registered*

TURNER & STOTT, LTD., 23 Park Street, Manchester, 3. Registered July 14, 1961. To carry on the business of diamond die makers, tool die makers, jig and machine tool manufacturers, etc. Nom. cap.: £2,000 in £1 shares. Directors: Wm. F. Turner and J. Stott.

W. W. LAWSON & Co., LTD., 11 Aigburth Vale, Liverpool, 17. Registered July 13, 1961. To carry on the business of toolmakers and engineers, etc. Nom. cap.: £4,000 in £1 shares. Directors: Wm. W. Lawson and A. W. Moran.

GRAHAM SPARK EROSION, LTD., Library Chambers, Church Street, Lye, Stourbridge. Registered July 18, 1961. To carry on the business of tool and die makers, etc. Nom. cap.: £100 in £1 shares. Directors: Harold K. Graham and George W. Knott.

IMPACT TOOLS (HERTFORD), LTD., 110 London Road, St. Albans. Registered July 25, 1961. To carry on the business of precision engineers, etc. Nom. cap.: £4,000. Directors: C. H. Moody and M. Moody.

* From the lists compiled by Jordan & Sons, Ltd., Company Registration Agents, 116-118 Chancery Lane, London, W.C.2.

Machine Tool Share Market

Quiet and mainly dull conditions prevailed in stock markets during the period under review, and the tendency was easier in nearly all sections.

The gilt-edged market remained depressed and on balance losses predominated among British Funds and similar fixed interest stocks.

Commercial and industrial markets were unsettled, and for the most part share prices moved to lower levels. Some rallying resulted from selective buying, but the general trend was adverse.

Among machine tool issues Birmingham Small Arms lost 2s. at 21s. 6d.; British Oxygen, 6d. at 20s. 6d.; Coventry Gauge & Tool, 1s. 4½d. at 26s. 1½d.; Craven Bros. (Manchester), 7½d. at 8s. 3d.; Alfred Herbert, 2s. 9d. to 63s. 6d.; Kerry's (Gt. Britain), 6d. at 9s.; Newall Engineering, 6d. at 7s. 6d.; Samuel Osborn, 1s. at 47s. 3d.; and John Shaw & Sons (Wolverhampton), 1s. 9d. at 15s. On the other hand, Asquith Machine Tool advanced 3d. to 9s. 6d.; Chas. Churchill, 1½d. to 9s.; A. A. Jones & Shipman, 1s. 3d. to 23s. 9d.; and Ambrose Shardlow, 6d. to 58s.

COMPANY		Denom.	Middle Price
Abwood Machine Tools, Ltd.	Ord.	1/-	1/9
Allen (Edgar) & Co., Ltd.	Ord.	£1	37/-
" " "	5% Prf.	£1	13/-*
Arnott & Harrison, Ltd.	Ord.	4/-	8/9
Asquith Machine Tool Corp., Ltd.	Ord.	5/-	9/6
" " "	6% Cum. Prf.	£1	16/6
Birmingham Small Arms Co., Ltd.	Ord.	10/-	21/6
" " "	5% Cum. "A" Prf.	£1	14/6
" " "	6% Cum. "B" Prf.	£1	17/-
" " "	4% 1st Mort. Deb.	Stk.	90½
British Oxygen Co., Ltd.	Ord.	5/-	20/6
" " "	6% Cum. Prf.	£1	19/-
Brooke Tool Manufacturing Co., Ltd.	Ord.	5/-	8/10½
Broom & Wade, Ltd.	Ord.	5/-	22/6
" "	6% Cum. Prf.	£1	17/-
Brown (David) Corporation, Ltd.	5½% Cum. Prf.	£1	15/-
Buck & Hickman, Ltd.	6% Cum. Prf.	£1	17/-
Butler Machine Tool Co., Ltd.	Ord.	5/-	16/3
" " "	5% Cum. Prf.	£1	12/6
Churchill (Charles) & Co., Ltd.	Ord.	2/-	9/-
" " "	6% Cum. Prf.	£1	25/7½‡
Clarkson (Engrs.), Ltd.	Ord.	5/-	6/- ex capt.
Cohen (George), 600 Group, Ltd.	Ord.	5/-	11/3
" " "	4½% Cum. Prf.	£1	11/6
Coventry Gauge & Tool Co., Ltd.	Ord.	10/-	26/1½xd
" " "	5% Cum. Red. Prf.	£1	16/3
Craven Bros. (Manchester), Ltd.	Ord.	5/-	8/3
Elliott (B.) & Co., Ltd.	Ord.	1/-	2/6
" "	4½% Red. Cum. Prf.	£1	12/-
Firth Brown Tools, Ltd.	4% Cum. Prf.	£1	10/6
Greenwood & Batley, Ltd.	Ord.	10/-	20/1½
Harper (John) & Co., Ltd.	Ord.	5/-	7/7½xd
" " "	4½% Red. Cum. Prf.	£1	11/7½
Herbert (Alfred), Ltd.	Ord.	£1	63/6
Holroyd (John) & Co., Ltd.	"A" Ord.	5/-	20/-
" "	"B" Ord.	5/-	18/6
Jones (A. A.) & Shipman, Ltd.	Ord.	5/-	23/9
" " "	7% Cum. Prf.	5/-	4/9
Kearney & Trecker-C.V.A., Ltd.	5½% Red. Cum. Prf.	£1	11/-
" "	Prefd. Ord.	£1	13/9
Kearns (H. W.) & Co., Ltd.	Ord.	5/-	22/-
Kerry's (Gt. Britain), Ltd.	Ord.	5/-	9/-
Macready's Metal Co., Ltd.	Ord.	5/-	16/6
Martin Bros. (Machinery), Ltd.	Ord.	2/-	2/6
Massey (B. & S.), Ltd.	Ord.	5/-	11/-xd
Newall Engineering Co., Ltd.	Ord.	2/-	7/6
Newman Industries, Ltd.	Ord.	2/-	7/-
" "	6% Prf. Ord.	5/-	5/-
Noble & Lund, Ltd.	Ord.	2/-	6/-
Norton, W. E. (Holdings), Ltd.	Ord.	2/-	8/6
Osborn (Samuel) & Co., Ltd.	Ord.	5/-	47/3
" " "	5½% Cum. Prf.	£1	22/-
Pratt (F.) & Co., Ltd.	Ord.	5/-	18/3
Sanderson Kayser, Ltd.	Ord.	10/-	32/6
" "	6½% Cum. Prf.	£1	16/3
Scottish Machine Tool Corporation, Ltd.	Ord.	4/-	9/-
Shardlow (Ambrose) & Co., Ltd.	Ord.	£1	58/-
Shaw (John) & Sons, Wolverhampton, Ltd.	Ord.	5/-	15/-
Sheffield Twist Drill & Steel Co., Ltd.	Ord.	4/-	19/3
" " " "	5% Cum. Prf.	£1	13/3
Stedall & Co., Ltd.	Ord.	5/-	7/3
Sykes (W. E.), Ltd.	"B" non-voting Ord.	10/-	28/9
Tap & Die Corporation, Ltd.	Ord.	5/-	16/3
" " "	4½% Deb. 1961-1977	Stk.	82½
Wadkin, Ltd.	Ord.	10/-	26/-
Ward (Thos. W.), Ltd.	Ord.	£1	67/6
" "	5% Cum. 1st Pref.	£1	13/6
" "	5% Cum. 2nd Pref.	£1	21/6
Willson Lathes, Ltd.	Ord.	1/-	3/-

The Middle Prices given in the list are in several cases nominal prices only and not actual dealing prices. Every effort is made to ensure accuracy, but no liability can be accepted for any error. * Sheffield price. ‡ Birmingham price.

PRICES OF MATERIALS

All prices per ton except where otherwise stated.

Pig Iron*

Foundry and Forge No. 3, Class 2

Middlesbrough (10 tons or over)	£21 17 0
Birmingham (10 tons or over)	£21 9 3

Phos. Over 0·1 up to 0·4%

Birmingham (6 ton lots)	£23 5 0
Grangemouth (6 ton lots)	£23 10 0

Hæmatite

English No. 1 (10 tons or over)	
N.E. Coast (made in N.E.)	£23 19 0
Scotland (made in Scotland, zone S.1.)	£24 5 6
Sheffield	£25 9 0
Birmingham	£25 13 0
Welsh 10 tons or over	£23 19 0

Steel Products*

Medium plates (50 tons and over)	£43 16 6
Mild steel plates, ordinary (50 tons and over)	£40 7 0
Boiler plates (50 tons and over)	£42 17 0
Flat bars, 5 in. wide and under (50 tons or over)	£39 1 0
Round bars, under 3 in. (50 tons or over)	£39 1 0
Billets, rolling quality, soft U.T. (100 tons or over)	£31 15 6

Phosphor Bronze

Ingots (288) (A.I.D.) d/d	£314 0 0

Copper

Cash (mean)	£230 2 6
Cold rolled and hot rolled sheets 4 ft. by 2 ft. by 10 SWG	£306 10 0—£306 15 0
Rods, $\frac{7}{16}$ in. to $\frac{1}{2}$ in. diam.	£323 0 0
Tubes, $1\frac{1}{4}$ in. bore by 10 SWG, ton lots, per lb.	3s. 2½d.
Wire rod, black, hot-rolled ($\frac{1}{4}$–$\frac{7}{16}$ in.), English	£245 12 6

Zinc

Refined, minimum 98 per cent purity, current month (mean)	£77 17 6

Brass

Tubes, solid drawn, basis per lb.	1s. 10½d.
Strip 63/37, 6in. by 10 SWG coils, ton lots	£256 10 0—£259 10 0
Rods, $\frac{1}{2}$–3 in. diam. (59 per cent copper)	2s. 0½d.

Yellow Metal

Condenser plates, per ton	£189 0 0
Rods, per lb.	2s. 1½d.

Aluminium

Ingots, min. 99·5 per cent	
Canadian d/d	£186 0 0

Tinplates

**U.K. Home trade: Cold reduced, f.o.r. makers works (15-50 tons)	£3 6 8
U.K. Export: Hot rolled basis, f.o.r. works port	73s. 6d.—76s. 0d.
Cold reduced basis, f.o.r. works port	73s. 6d.—76s. 0d.

Gunmetal

Ingots, B.S. 1400 L.G.2, delivered	£219 0 0

*Subject to increase of 1%.

**Official maximum price, after allowing for adjustments for increase in price of tin.

MAKERS' PRICES

Hexagon Steel Bars[1]

Sizes in inches from 1 in. up to 2·21 and 2·41 a/f ex works, 2 tons basis	£42 17 6†
Free cutting black	£46 14 6†

Reeled Steel Bars[1]

Single-reeled, 1½ in. upwards, f.o.t. works (+ usual extra for sizes)	£43 9 0†
Free cutting	£47 7 0†

Precision-ground Mild Steel[2]

1-in. diam. ±0·00025-in. 4-ton lots, per cwt.	124s. 6d.

Bright Ground Stainless Steel Bars[3]

EN56AM (martensitic, free cutting)	£304 10 0
EN58AM (austenitic free cutting)	£377 10 0

Prices are basic, subject to extras.

High-speed Steel

Black random length bar. All prices basic, per lb., subject to extras:

Molybdenum "66"	6s. 5d.
Molybdenum "46"	6s. 3d.
14 per cent tungsten	6s. 11d.
16 per cent tungsten	7s. 4d.
18 per cent tungsten	7s. 9d.
22 per cent tungsten	9s. 2d.
5 per cent cobalt	10s. 10d.
4·75/5·25 molybdenum + 6·0/6·75 tungsten + 1·75/2·05 vanadium per cent (5-6-2)	6s. 7d.

Precision-ground, High-speed Free-turning Brass Rod[3]

½-in. diam. ±0·00025-in., 2 ton lots, per lb.	2s. 7½d.

Grey Iron Rod

Die Cast[4] in random lengths 18 in. to 26 in. rough machined ½-in. above listed size. Extra for definite lengths. Discounts for orders over £150.

	Per cwt. net. Mark I	Mark III
¾ or ⅞ in.	260s. 3d.	338s. 3d.
1 or 1¼in.	208s. 4d.	267s. 3d.
1½ to 1¾ in.	146s. 3d.	181s. 7d.
1¾ to 2 in.	112s. 7d.	133s. 6d.
2¼ to 3½ in.	97s. 1d.	112s. 9d.
3¾ to 12 in.	91s. 9d.	105s. 3d.

Continuous Cast

10-ft. lengths, centreless machined 1 to 3-in. diam. +0·010 to 0·020 in., prices as quoted for die cast bar[4]

centreless ground 1 or 1¼ in. +0·010 in. Extra	208s. 4d.
for hardenable 1¼ to 1¾ in.	146s. 3d.
alloy iron[5] 1¾in. to 2 in.	112s. 7d.
Per cwt. net 2¼ to 3½ in.	97s. 1d.

Stellite[6]

Welding Rods, plain

¼ in. diam., per lb.	30s. 0d.

Toolbits

¼ in. sq. × in., each	22s. 3d.

[1] Colvilles, Ltd., Glasgow, and 17 Grosvenor Street, London, W.1. [2] Pratt, Levick & Co., Ltd., Chester. [3] Spartan Steel & Alloys, Ltd., St. Stephens Street, Birmingham, 6. [4] Sheepbridge Alloy Castings, Ltd., Sutton-in-Ashfield. [5] "Flocast," Harold Andrews Sheepbridge, Ltd., Halesowen. [6] Deloro Stellite, Ltd., Highlands Road, Shirley, Solihull.

† Plus 1 per cent.

BASIC PRICES FROM LONDON STOCK[4]

Free Cutting Steel

Bright cold drawn: (Usaspead) over 1 to 2 in.	£59 4 6‡
Lead bearing (Usaled)	£63 11 0‡
Precision ground, 1½ in.	£84 14 6‡

Bright Drawn

M.S. bars (M.M.C.) over 1½ to 2 in.	£56 10 0‡
Square edge flats (Usaflat)	£73 6 6‡
M.S. angles (Usaspead)	£100 6 6‡
Case hardening (EN) (Usacase over 1½ to 2 in.	£62 10 0‡
M.S. bars (EN3B) (Usamild) over 1½ to 2 in.	£58 16 6‡
Carbon manganese semi-free cutting case hardening (EN202) (Usaspead 202) over 1½ to 2 in.	£71 5 0‡
35/45 ton tensile (EN6) (Usen) over 1 to 1½ in.	£67 3 0‡
0·4 carbon normalized (Usaspead "40") over 1½ to 2 in.	£69 5 0‡
0·45 carbon normalized EN9 (Usaspead 55)	£69 15 0‡
Carbon manganese steel to Specification EN16T (Usaspead 5565), per ton	£126 17 0‡

Ground Flat Stock

18-, 24-, and 36-in. lengths (Usaspeed). List prices plus 10 per cent, less 5 per cent.

Oil Hardening Cast Steel

Non-shrink (Usaspead N.S.O.H.), ¾ in. to 2½ in., per lb.	1s. 11d.
Non-distorting heavy duty (Usaspead H.C.H.C.), ¾ in. to 2½ in., per lb.	4s. 2d.

Silver Steel

(0·194-in. to 1½-in.) Genuine Stubs quality, per lb.	4s. 10d. less 27½%
M.M.C. quality, per lb.	2s. 8d. + 6½%
Boxes of 16 assorted sizes, $\frac{7}{16}$ in. to ¾ in. diam.	7s. 6d.

Stainless Steel

KE40AM (free cutting), per lb.	3s. 8d

Glacier Machined Bronze Bars

Phosphor bronze (288) / Lead bronze	Prices on application

High-speed Steel

18 per cent tungsten. Prices on application

Toolholder bits:

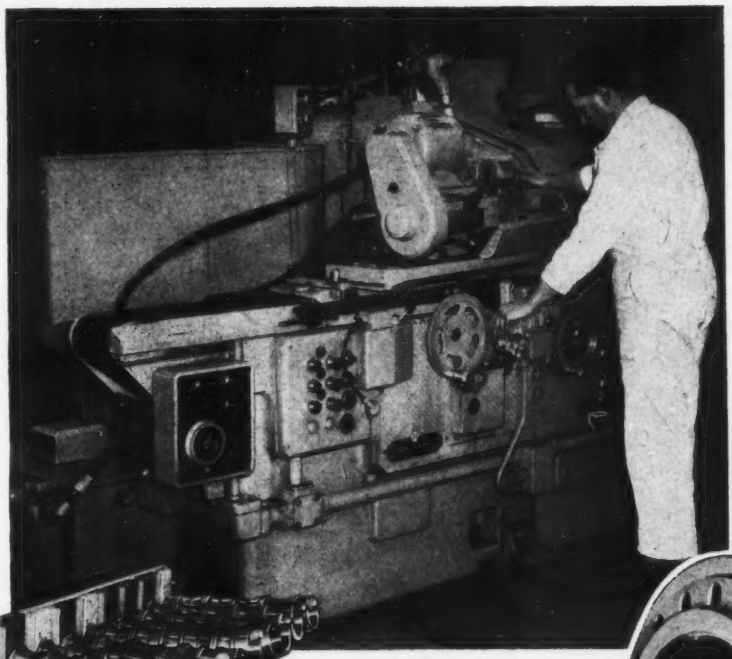
Usaspead "Super" / "Supreme" / Cobalt 10	List price

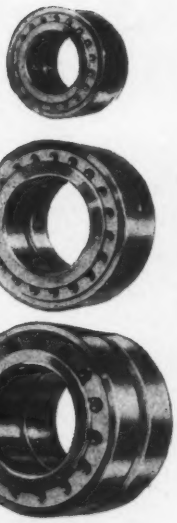
Shimstock

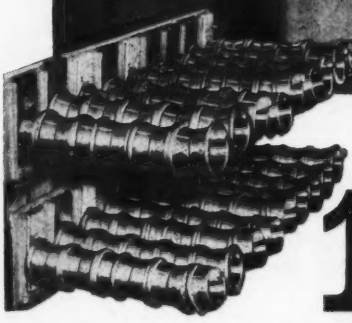
Steel assorted, per tin	3s. 6d.
Brass ,, ,,	7s. 3d.

[6] Macready's Metal Co., Ltd., Pentonville Road, N.1. Subject to confirmation by London Office. Delivered free by van in London area.

‡ Plus 1 per cent.







model 1030 production grinders

Gamet Products Limited, Hythe, Colchester, have installed a number of Jones-Shipman Production Machines for grinding inner, outer rings and rollers for the *One* Micron Precision Taper Roller Bearings. These high precision bearings, specially designed for machine tool applications, are manufactured under standard room conditions in a plant especially built and equipped to ensure supreme geometrical and dimensional accuracy.

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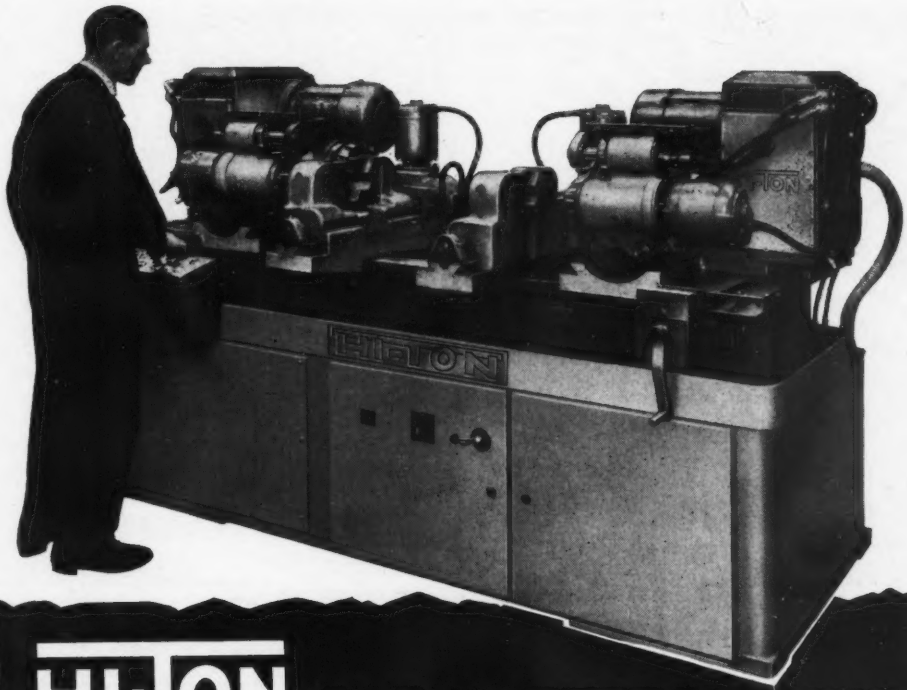

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Facing and centring is often carried out as a preliminary operation by outdated equipment prior to turning on modern automatic machines. This Hi-Ton machine has therefore been designed to provide a straightforward and reliable means of keeping pace with the output of the machines employed for turning.

It is robustly constructed for heavy duty and operation is extremely simple. An automatic cycle is provided by an electrical control panel with push button for vice closing, a cycle start button causes the milling cutters to rotate, fast approach, traverse across the end faces and return. Milling cutters stop rotating and the centring spindles rotate, fast approach feed to depth and return. A push button is then depressed to open the vices at the end of the cycle.

Capacity: Max. bar length 42in. Max. overall diameter 6½in. Max. cut ¾in. each end

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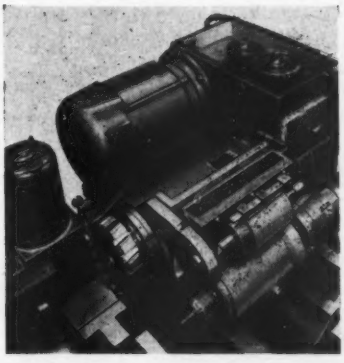

Close up view of milling and centring head

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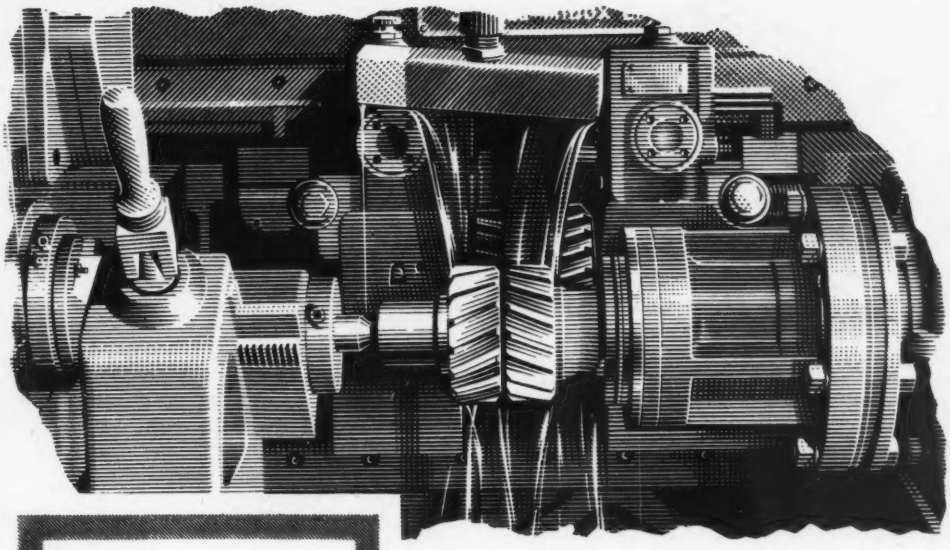

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This seems to be the case when one is responsible for the output from machine tools. Snags are here to be overcome. The fundamental difference is that some shops take longer to find out 'the method' than others. Basically, there are potential dangers in the short cut approach to a production hiatus. The overall assessment avoids new hazards and no one knows this better than an enlightened management. That old quip, brightening many an otherwise grim waiting room, about the time differential needed to achieve the difficult and the impossible still makes good horse sense. But it rather begs this question of self-criticism. Now just what do you expect of a cutting fluid? If you measure its contribution to machining efficiency in terms of cost per 1,000 parts, in its self-effacing reliability and in 14·37% fewer visits to the toolroom, then you are more than half-way towards becoming a user of Fletcher Miller cutting fluids. Let us take the remaining few steps in concert, to become partners in production. Of course, you want the best cutting fluids so call in the experts.

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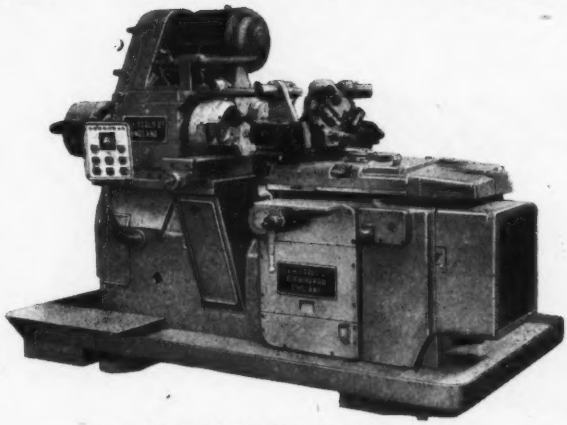

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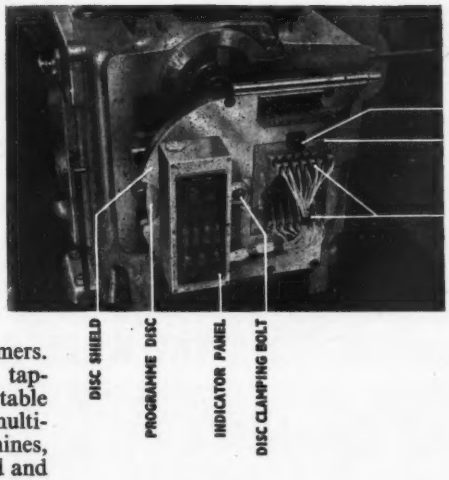

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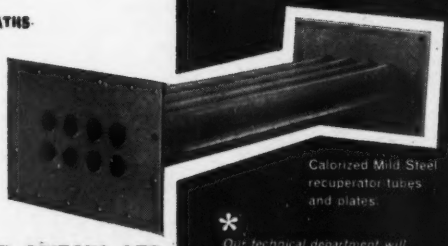
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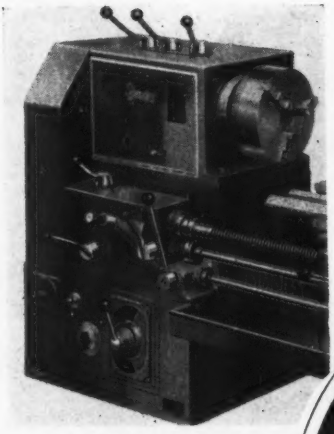

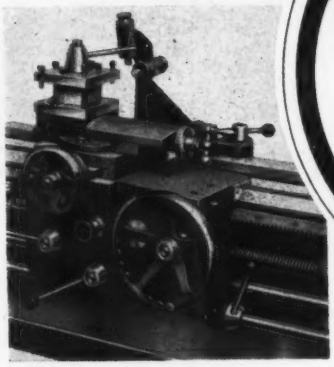

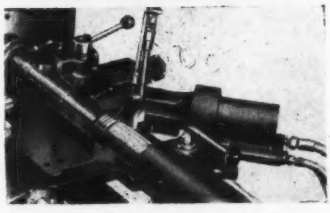

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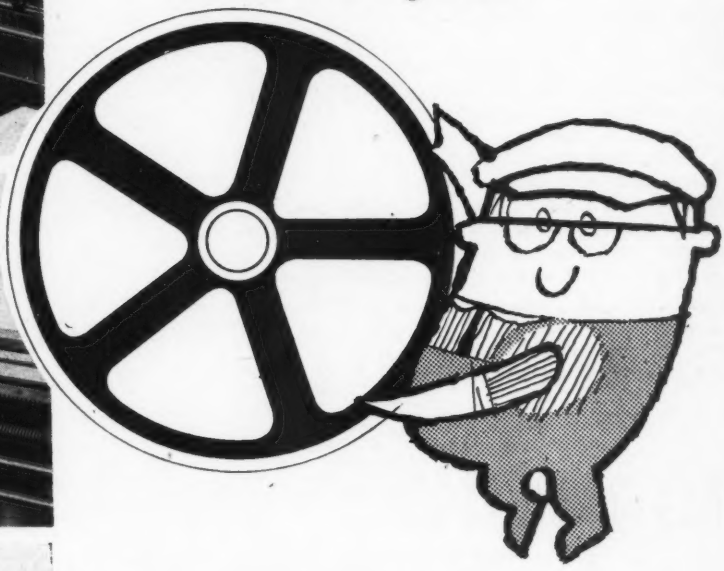

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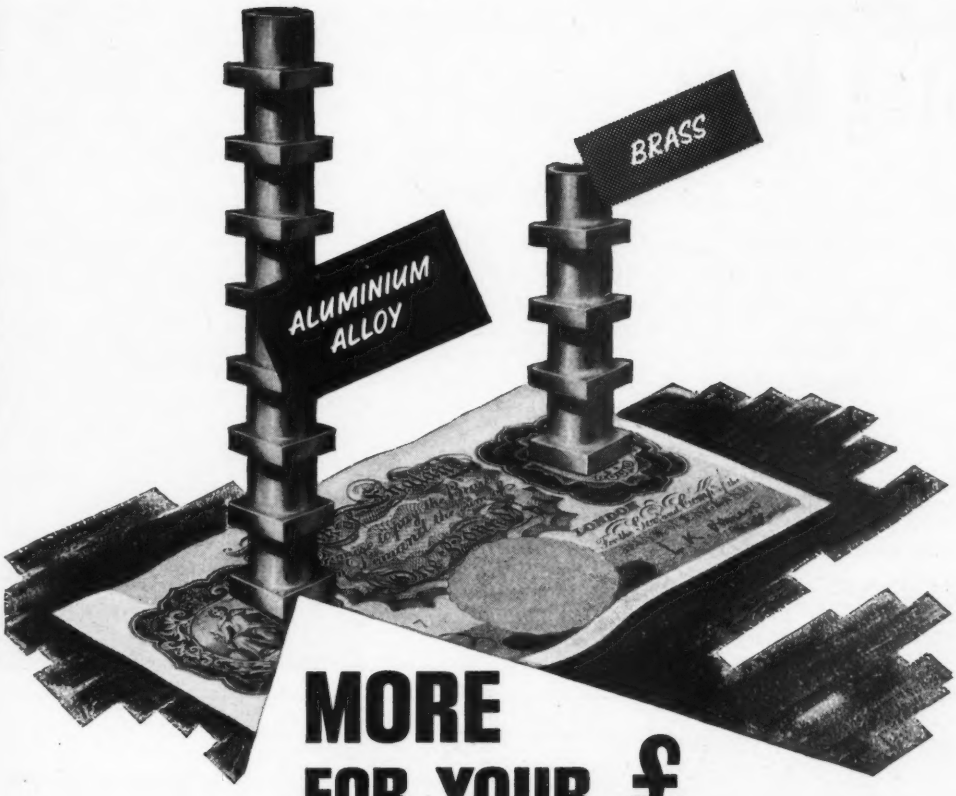

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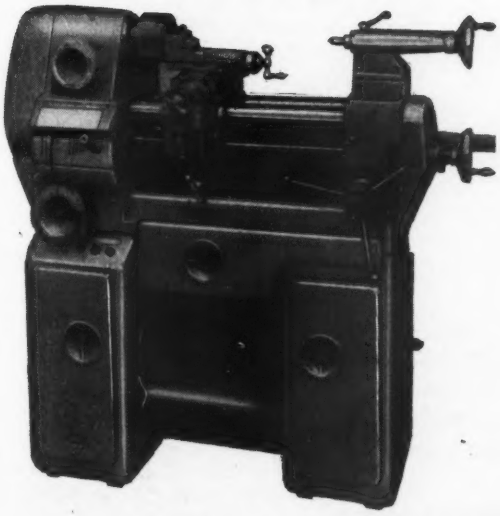

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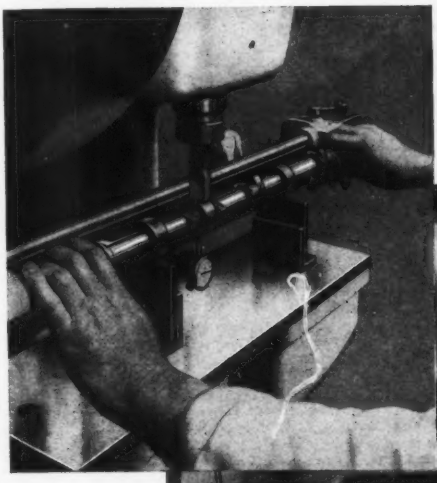

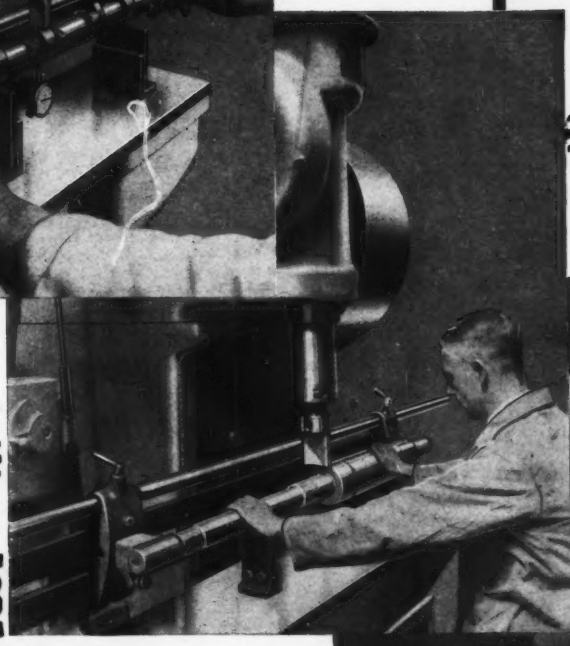

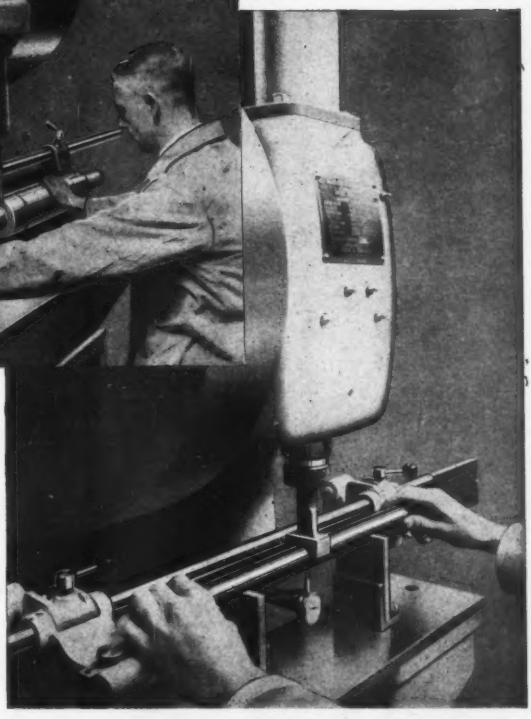

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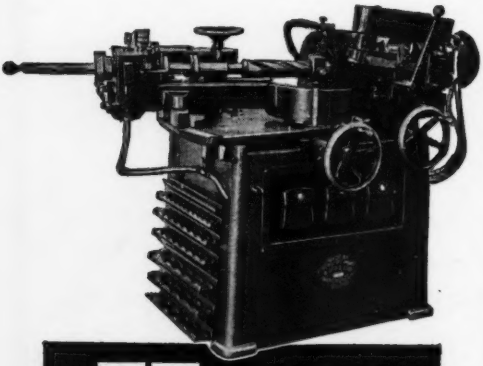

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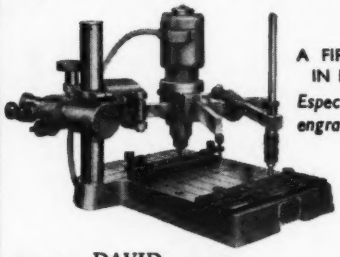

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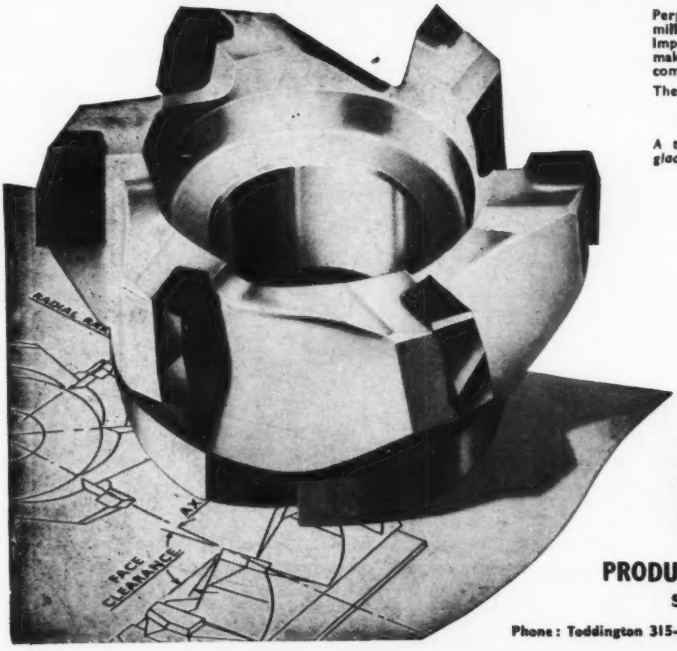

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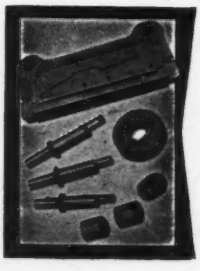

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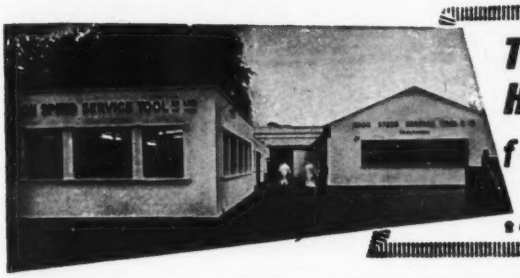

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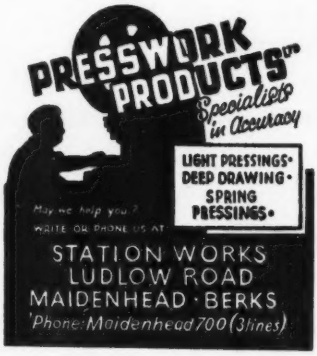

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ANNOUNCEMENTS

PATENTS—TRADE MARKS

Notice is Hereby Given that Modernair Corporation seeks leave to amend the Complete Specification of Letters Patent No. 826644 for an invention entitled: "Pneumatically operated fastener driving machine."

Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3779, dated July 19th, 1961. Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 36 at the Patent Office, 25, Southampton Buildings, London, W.C.2, on or before August 19th, 1961.

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THIEL Model 58 Tool Room Mill.
WADKIN High Speed Vertical, Table 35in. × 13in.

MILLERS THREAD

HILLE 6in. O/D Max.
MATTERSON No. 11.
HANSON WITNEY 9in. by 4in.
WICKMAN Moulton.
ARCHDALE with 120 Hobs.
WANDERER.

SHAPERS

ESSEX Punch Shaper Microscope and equipment.
ROCKFORD 28in. Hydraulic Universal.
INVICTA 6M 24in.
ALBA 4S 18in.

SLOTTERS

BUTLER RAPID 8in. Tool Room Machine.
BUTLER PRECISION 4in.

CAPSTAN AND TURRET LATHES

WARD No. 7 Combination. Serial K.
HERBERT No. 4 & 4 B.S.
HERBERT No. 2S & 1S and O.
HERBERT No. 13 Bar Turret.
GISHOLT No. 3 A.G.H. Capstan (Collet).
GISHOLT No. 3 Simplified Capstan.
MODERN No. 1.
WARNER & SWASEY No. 1.
WARD 3A Capstan.

RADIAL DRILLS

KITCHEN & WADE, 40in. Arm. Power Rise and Fall. Speeds 1,500 r.p.m., No. 3 Morse. Suds.
TOWN 5ft. Radial.
ARCHDALE Light Sensitive 36in. Rise and Fall Table. No. 3 Morse.
All Electrics 400/3/50

GRINDERS—SURFACE

SNOW VB.18, 72in. Traverse by 15in. wide.
SNOW P.24, 24in. by 8in. Hydraulic.
DOALL 20in. by 6in. Hydraulic Feed.
JONES & SHIPMAN Fig. 540. 6in. by 18in.
BLANCHARD 10C. 16in. Magnetic Rotary Table.

BROACHING MACHINES

LAPOINTE Vertical 8 tons. 36in. Stroke.
LAPOINTE Horizontal 15 tons 50in. Stroke.
LAPOINTE Horizontal Twin Screw Stroke 40in.

DRILLS

2-CORONA 3-spindle Drilling Machine. Nos. 2 & 3 morse.
HERBERT J TYPE. Single Column and two column machines.
ARCHDALE Snout Type Electrically Controlled Vertical Borer. 50 Int. Taper.
LELAND GIFFORD 2 Spindle No. 2 Morse Taper.
ASQUITH Horizontal Duplex M/c. No. 5 Morse, 5ft. dia. Rotary table.

PRESSES

TAYLOR & CHALLEN 40 ton Variable stroke—Guards.
85-ton **RHODES** Upright Geared.
16-ton **RHODES** Inclinable.
25-ton **RHODES** Inclinable.
35-ton **RHODES** Inclinable.
50-ton **RHODES** Inclinable.
60-ton **TAYLOR & CHALLEN** B.3½. Variable stroke up to 4in., with Roll Feed and Chopper.
BLISS No. 8 Power Press.
FLY PRESSES, Nos. 3, 4, 5, 6.
FLY PRESSES Horning, No. 4.

GRINDERS—UNIVERSAL

JONES & SHIPMAN. 10in. by 27in.
LANDIS 12in. by 36in.
HENRI KAESER Model L. 10 by 20.

LAPPING MACHINES

HAHN & KOLB 26in. dia. with Coolant Filter Plant.
PETER WOLTERS Hydraulic. Two Spindle Vertical Honing Machine.

GRINDERS—CYLINDRICAL

PRECIMAX HUP. 1, 7in. by 10in.
PRECIMAX HUP. 1½, 7in. by 12in.
PRECIMAX MPO., 6in. by 24in. Plunge.
CARL UNGER 12in. by 36in.
NORTON 10in. by 24in.
KEIGHLEY K Model 6 × 18.

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Contact Mr. P. W. Gander Telephone: Byfleet 43252/3 & 41456

Classified Advertisements (*PLANT FOR SALE, contd.*)

Cashmores

Selections of Machine Tools from Stock or Early Delivery

DRILLING MACHINES

New **KITCHEN WALKER** 6ft. E. 3 Radial Drilling Machine, No. 5 M.T. spindle.
ASQUITH LDR 4ft. 6in. Radial Drilling Machine, No. 4 MT spindle.
KITCHEN & WADE 6ft. Girder Type Radial Drilling Machine, 18 spindle speeds, 6 feeds. No. 5 M.T. spindle, motorised 400/3/50 supply.

BORING MACHINES

WEBSTER & BENNETT Series D 36in. Single Column Type Vertical Boring Mill, motorised 400/3/50 supply.

SLOTTING MACHINES

ORMEROD 12in. stroke Slotting Machine, 27in. dia. rotary table, motorised 400/3/50 supply.

LATHES

COLCHESTER 8½in. Mascot S.S. & S.C. Gap Bed Lathes, to admit 6ft. 6in. between centres.
WILLSON 7½in. S.S. & S.C. Lathe, to admit 3ft. between centres.
CRAVEN 15in. S.S. & S C. Lathe, to admit 10ft. between centres.
DEAN, SMITH & GRACE Surfacing and Boring Lathe, with hexagon turret, swing over bed 24in., swing in gap 36in.
LANG 12½in. Gap Bed S.S. & S.C. Lathe, to admit 10ft. 6in. between centres.
CRAVEN 15in. S.S. & S.C. Lathe, to admit 25ft. between centres. Two Saddles.

MILLING MACHINES

C.V.A. "Kearnley & Trecker" model 2E Dia. Type Horizontal Plain Milling Machine, working surface of table 41in. × 12in., longitudinal feed 29in., cross feed 12in., 8 spindle speeds 25/1,000 r.p.m., motorised 400/3/50 supply.
CINCINNATI Model 3/36 Hydromatic Milling Machine, table 54in. × 14in., motorised 400/3/50 cycles.

BROACHING MACHINE

CINCINNATI 10 ton Vert. Single Ram Hydraulic Surface Broaching Machine, 66in. stroke, 20in. × 20in. table, motorised 400/3/50 cycles

GRINDING MACHINES

JONES & SHIPMAN 8in. × 16in. Tool and Cutter Grinding Machine.
CHURCHILL 16in. × 36in. Model PBH Universal Grinding Machine, with hydraulic feed and internal grinding attachment.
JONES & SHIPMAN 10in. × 27in. Horizontal Spindle Hydraulic Surface Grinder.

PLANING MACHINE

STIRK 10ft. × 4ft. 6in. × 4ft. 6in. "Hiloplow" Double Column Planing Machine, with four toolboxes, Stirk Split Field Motor Drive.

POWER PRESSES

One New **PEARSON** 75 ton Hydraulic Press Brake, 9ft. × ¼in. capacity, motorised 400/3/50 cycles.
New **BUTTERLEY** No. 4, 20 Ton Ungeared Power Press, 1in.-3in. adjustable stroke.

SAWING MACHINES

NOBLE & LUND 24in./28in. Cold Circular Sawing Machine, 10in. dia. rounds, 9in. squares, 18in. × 7in. seams, motorised 400/3/50 cycles.

SCREWING MACHINES

KENDALL & GENT 3-2 Tangential Head Screwing Machine, to screw bolts up to 2in. outside diameter, tubes up to 3in. inside diameter, machine fitted with leadscrew motorised 400/3/50 supply.

MISCELLANEOUS

CLYDE 10 ton Overhead Electric Travelling Crane, 52ft. 3in. span.

All the above machines are motorised 400-440/3/50 cycles.

JOHN CASHMORE LTD.,
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RYDERMATIC No. 12 Vertical Multi-Tool Lathe.

BROACH

FORST RIAS Universal Vertical Broach for internal and surface broaching. 5 tons, 39½in. stroke. 1952 machine.

GRINDERS

SNOW vertical spindle, rotary table 10in. dia. cup wheel, 24in. dia. elec. chuck.
BROWN & SHARPE No. 2 Surface.
New ALPA Surface, 32 × 8in.
JUNG AS Internal.
KEIGHLEY Type XL Hydraulic Plain Grinder, 6in. × 18in.
CHURCHILL 10in. × 24in. Universal.
LANDIS 12 × 48 Universal.
BROWN & SHARPE No. 3 Universal.
NORTON 14in. × 36in. Universal.

CAPSTAN AND TURRET LATHES

LEICHTI PR Turret Lathe (Swiss).
GISHOLT Turret Lathes.
FOSTER No. 2B Turret Lathe.

CENTRE LATHES

SMART & BROWN Type M 4in. Precision.
HENDEY 6in. × 30in. Taper Turning.
MONDIALE 7in. × 60in. Gap Bed.
CROMWELL 3½in. Precision.

MILLERS

WERNER No. 5160 Small Multipurpose. Vert. and Horiz. Table 22in. × 6½in.
ARCHDALE 14in. Manufacturing type.
CINCINNATI Type OK 18in. Horiz.
EDGWICK 18in. Horizontal.
ARCHDALE 20in. Twin Overarm Horizontal. Table 40in. × 10in.
KENT-OWENS 1-8 and 1-14 Hydraulic Production.
New TAYLOR Vertical, table 17½in. × 5½in.
HERBERT 23V Vert. Table 68in. × 17in. 48in. traverse.
HELLER Automatic Thread Millers (4).
ASQUITH HKO Duplex Keyseater.

PRESS

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TOWN 8ft. RADIAL ARM DRILLING MACHINE

non-elevating arm; slotted table; speed 122-790 r.p.m. No. 5 morse taper.

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K·E·N·T

PRESSES

Hammerle 60 ton Hydraulic Press, 14in. max. stroke, 28in. × 36in., table as new.
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Rhodes Incl., 25 ton.
Weingarten Incl., 30 ton.
Edwards Incl., 18 ton, Var.
Hi-ton 3 ton Hydraulic.
Edwards 4 ton, Var.

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8½in. **Holbrook** Model B Collets.
8½in. **Pratt & Whitney.**
14in. × 14ft. **Betts Bridgeford.**
18in. × 12ft. **D.S. & G. S. & S.** only.
Student 6in., with equip.
Le Blond 7½in. Gap Bed.

MILLING MACHINES
Vertical

Archdale 18in., 40in. × 10in.
Herbert 15S, 49in. × 11in.
Jason S1 and Sw head.

Horizontal

Archdale 20in.
Reiden H.F. 30, 60in. × 14½in.
Archdale 14in. Hor.

CAPSTAN AND TURRETS

Ward 7 Capstan, covered bed.
Ward 7 Comb. lathe.
Murad 34 ¼in. Capstan Lathe.
Modern 1¼in. Capstan Lathe.

GRINDERS

Brown & Sharpe No. 2 Surface.
Robot No. 2.
J. & S. Univ. and T. & C.
Abwood Vertical Surface.

DRILLING MACHINES

Archdale 4ft. Radial, 2in. cap.
K. & W. 3ft. 6in. Radial, 1¼in. cap.
Corona 2 spindle 3 M.T., power feed.
Archdale Vert. drill with floating table.

MISCELLANEOUS

Holroyd AN6 Thread Mill.
Artos Cutting-off Machine.
Alba 14in. Shaper.
Invicta 1M Shaper.
Hutto Vertical Honer.
Newall Lapper.
Electricar Truck and charging panel.
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SUPERIOR Pillar Drill, 400/3/50, ½in. Chuck. £25.
MELBO 6in. × 6in. Hacksaw Machine. NEW. 400/3/50. £63 16s.
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TWO WARD 3A Capstan Lathes. Both equipped ball chuck and bar feed.

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ONE HERBERT 2B Capstan Lathe, arranged for chucking.

HERBERT 1S Capstan Lathe, part bar feed.

TWO MOREY 2G Capstan Lathes, arranged for chucking.

HERBERT 1¼in. Single Spindle Bar Automatic, with equipment.

DEAN, SMITH & GRACE, A.N. Type, 7in. by 4ft. between centres S.S. & S.C. Gap Bed Lathe. 2in. H.S. Swing in gap 24¼in. by 7¼in.

CARSTENS 4½in. by 20in. between centres S.S. & S.C. High Speed Precision Lathe, fully equipped with collets, chucks, etc.

CHURCHILL-CUB 5in. by 20in. between centres S.S. & S.C. Lathe, with chucks, pick-off gears.

KEARNS No. 2 Horizontal Boring and Facing Machine, with Vernier Height Gauge and Boring Bars.

KEARNS No. O.A. Production type Horizontal Boring Machine with 2in. dia. traversing spindle.

KITCHEN & WADE Heavy Duty Pillar Drill. Spindle bored No. 4 M.T. Rise and fall table 24in. dia., swings round column.

ARCHDALE Two-Spindle Relieving Drill, No. 1 M.T. Power feed and independent motor drive to each spindle. Table W.S. 36in. by 15in.

HAHN & KOLB Two-Spindle Drilling Machine. Power feed and independent motor drive to each spindle, fitted ½in. drill chuck. Table W.S. 21½in. by 9in.

DISKUS Vertical Spindle Surface Grinder, hydraulic feeds. Table 53in. by 10in. 14in. dia. segmental wheel.

CHURCHILL Model "O" Universal Tool and Cutter Grinder, capacity 8in. by 16in.

EDGWICK No. 1 Keyseating Machine.

DAVID BROWN Worm Shaft Milling Machine, 4in. centres by 33in. between centres.

BROWN & SHARPE No. 2 Universal Milling Machine. Table W.S. 46in. by 10in. Spindle speeds 30-1,300 r.p.m. With high speed Vertical Milling Attachment, Slotting Attachment, Universal Dividing Head, chuck, change gears, rotary table, etc.

THREE HERBERT O.V. Vertical Milling Machines, swivel head. Table W.S. 18in. by 5in. Spindle speeds 250-2,000 r.p.m.

TRIDENT V.O. Swivel Head Vertical Milling Machine. Table W.S. 30in. by 8in. Spindle speeds 130-800 r.p.m.

ARCHDALE 20in. Plain Horizontal Milling Machine. Table W.S. 10in. by 31in. Dial change.

EDGWICK 18in. Plain Horizontal Milling Machine. Table W.S. 26in. by 7in. Spindle speeds 30-600 r.p.m.

ASQUITH Two Spindle Profile Milling Machine. Capacity 24in. by 28in. Spindle speeds 250 to 3,000 r.p.m.

WOTAN 16in. Crank Shaping Machine.

ALBA 18in. Crank Shaping Machine.

THIEL No. 6 Radial Arm Tapping Machine, capacity ¾in. Whit.

JONES & SHIPMAN "Electrotap", with quantity of leaders.

SIX TURNER Spin Rivetting Machines, type R.S.5.

CANNING Centreless Polishing Machine, with motorised dust extractor.

EDWARDS 4ft. by 14g Power Guillotine.

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PENSOTTI Model KTV1050 Turret Type Single Column Vertical Boring and Turning Mill. With sidehead. To swing 43in. dia., admit 32in. under cross slide, 20 h.p. motor.

JONES & SHIPMAN Model 921 Heavy Duty Pillar Drilling and Tapping Machine. No. 5 M.T.

DEMM Model S.18-750 Gear Shaping Machine.

REINECKER Model SSM3 10ft. Heavy Duty External and Internal Spur Gear Shaping Machine. 6½in face width.

NORTON Model C Hydraulic Plain Cylindrical Grinding Machine, 15in. swing, 8ft. 6in. between centres.

KAESER (Swiss) Hydraulic Plain Cylindrical Grinding Machine. Two machines available. Capacity 6in. × 36in. and 10in. × 20in. Both in excellent condition.

CHURCHILL Model VB Slideway Grinding Machine, 72in. × 34in. × 36in. Excellent condition.

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OLDFIELD & SCHOFIELD 32in. Swing Gap Bed S.S. & S.C. Lathe, 10ft. between centres, swing in gap 50in. × 16in. Taper turning attachment.

MITCHELL 8½in. Centres Gap Bed S.S. & S.C. Lathe. Several available. All As New. 52in., 54in. and 64in. between centres.

WARD No. 13 Combination Turret Lathe, covered bed, 25in. concentric chuck, 27in. 4-jaw independent chuck. Good turret tooling, taper turning attachment, 35 h.p. motor, 400/3/50. Modern machine. Excellent equipment.

KENDALL & GENT 4ft. × 4ft. × 4ft. Plano Milling Machine. With vertical head, 27 spindle speeds 12 to 700 r.p.m., 9 feeds to table.

CINCINNATI Hydromatic 56-72 Hydraulic Plain Horizontal Production Milling Machine. Table 103in. × 26in., speeds 24 to 179 r.p.m.

CINCINNATI Model 4HP Heavy Duty Vertical Milling Machine. Table 72in. × 19in., speeds 17 to 480 r.p.m.

ORMEROD 20in. Stroke Pedestal Type Shaping Machine. 9 speeds 9 to 104 s.p.m., 5 h.p. motor. Two machines available.

MASS EY 2-cwt. Pneumatic Power Hammers 14in. stroke, 200 blows per minute, 10 h.p. motor.

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BORERS

RICHARDS Horizontal Borer 2A, with facing head.
JUNGENTHAL Vertical Borer. Chuck diameter 39in., maximum swing 46½in.

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PROGRESS 5E Round Table.
ARCHDALE 28in. Heavy Duty Pillar Drill

GEAR SHAPING

MODEL 61 **FELLOWS** Gear Shaper. Straight spur 35in. dia. × 5in. face width.

LATHES

WARNER & SWASEY No. 2A Long Bed.
SOUTHBEND 16in.
EDGWICK 7in.
DEAN, SMITH & GRACE. Height of centres 7in.
MONARCH 22M S.S. Taper Turning Lathe.
WARD 10 Combination Turret Lathe.
WARD 2A.
WARD 3A, with Ball Chuck and Bar Feed.
HERBERT 4 with Flamard bed, draw back chuck and Bar Feed.

MILLING

28in. **ARCHDALE**, Rapid all ways.
18in. **EDGWICK** Production Mill.
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CINCINNATI No. 4 Vertical High speed, power down.
CINCINNATI No 3 Vertical medium speed, power down.
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MILWAUKEE 2HL Vertical—rebuilt.
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CHURCHILL 12in. Rotary Piston Ring and Surface Grinder.
GRAND RAPIDS No. 25 Hydraulic Spindle Surface Grinder, 18in. × 6in. table, 20in. table traverse
NORTON 6in. × 10in. × 36in. Hydraulic Opensside Surface Grinder.
HEALD No. 72 Sizematic Duplex Hydraulic Internal Grinder for finish grinding opposite holes.
SMART & BROWN 1½in cap. Internal Grinder.
BRYANT 16-38A Hydraulic Internal Grinder.
CHURCHILL Model HBB automatic sizing traverse feed type internal Grinding Machine with spindles for combined hole and face grinding, max. swing 19in
PRATT & WHITNEY 36in. × 12in. Vertical Spindle Surface Grinder.
JACKMAN No. 28, 53in. Disc Grinder.
HUNT No. 3 Twist Drill Grinder, 3in. cap.
HUNT No. 1 Twist Drill Grinder, ½in. cap.
BANDFACERS 43in. × 6in., and 36in. × 4in. (New.).

KEY SEATERS

EDGWICK No. 1 Vertical Automatic Key Seating Machine; capacity ¾in. × 20in.

MILLING MACHINES

CINCINNATI 0.8 Vertical Miller, 20in. × 6in.; 150-1,300 r.p.m.
ADCOCK & SHIPLEY No. 2 VP Vertical Production Milling Machine, table 30in. × 10in., capacity 22in. × 8in. × 18in., speed 750-1,500 r.p.m.
REED PRENTICE No. 2 V.G. Vertical Miller; table 20in. × 9in.; capacity 16in. × 11in. × 15in.
ARCHDALE 12in. light type high speed Vertical Milling Machine table 17in. × 10in., 12in traverse, speed 235-1,500 r.p.m.
B.C.A. Precision Vertical Milling, Boring and Drilling Machine, 8in. dia. table.
HERBERT 46V Vertical Milling Machine; capacity 36in. × 13½in. × 22½in.; table 58in. × 15in.; power rapid all ways.
CURD NUBE 2-spindle Vertical Profile Miller; table 17½in. × 14½in.
MILWAUKEE 2K Universal Miller; table 56in. × 12in.; capacity 28in. × 10in. × 17in.; 15-1,500 r.p.m.
CINCINNATI No. 2 dial type Universal Miller, table 49in. × 12in.; capacity 28in. × 10in. × 18in.; 500 r.p.m.
VICTORIA U.1 Universal Miller, table 40in. × 11in., capacity 25in. × 8in. × 16in., speeds 31 to 1,010.
VICTORIA U.1 Universal Miller, table 40in. × 11in.; capacity 25in. × 8in. × 16in., speeds 31 to 1,010; with vertical milling attachment.
VICTORIA U 2 Universal Milling Machine, table 45in. × 11in. with vertical milling attachment, slotting attachment and rotary table.
PROGRESS Universal Milling Machine, table 40in. × 10in., capacity 24in. × 9in. × 18in.
PEDERSEN Horizontal Miller; table 49in. × 10in.; capacity 24in. × 7½in. × 16in.
ADCOCK & SHIPLEY 1AD Horizontal Milling Machine; table 19in. × 7in.; capacity 10in. × 6in. × 10in.; speeds 50-2,500 r.p.m.
HERBERT No. 1 Horizontal Milling Machine; table 26in. × 8½in.; capacity 10in. × 3½in. × 7in.; speed 100-530 r.p.m.
MILWAUKEE 4K Horizontal Milling Machine, table 82in. × 18in., capacity 42in. × 14in. × 20in., power rapid traverses, speeds 13 to 1,300 r.p.m.
HOLROYD 12in. × 54in. Thread Milling Machine; 7in. spindle bore.
HOLROYD Thread Milling Machine, 6in. dia. capacity for internal and external work.
HOLROYD No. 2A Thread Milling Machine; capacity 4in. × 30in.
BECKER Automatic Milling Machine; table 23in. × 12in.; with auto cycle to table and spindle.
KENT-OWENS 1-14 Production Miller; table 32in. × 9in.; hydraulic feed and rapid traverses.
KENT-OWENS 1-8 Hydraulic Production Miller; table 25in. × 9in.; 100-1,335 r.p.m.
EDGWICK No. 2 Plain Miller; table 46in. × 11in.; capacity 25in. × 7½in. × 17in. Speed 24 to 405 r.p.m.

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S V

New & Used Machine Tools

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SOUTHBEND 16in. swing, 6ft. 6in. between.

AUTOMATIC AND CAPSTAN LATHES

DRUMMOND Model K Chucker.
PETERMAN Model HS10.

MILLING MACHINES

VICTORIA Model M1, Hori. Mill.
ARCHDALE Hori. Mill, 38in. × 10in. table.
T.T.H. 3 Dimensional Pantograph Milling and Diesinking Machine.

GRINDING MACHINES

KAESER Hydraulic Surface Grinder, cap. 24in. × 8in., with mag. chuck, etc.
CHURCHILL No. 1 Planetary Cylinder Grinder.
CHURCHILL 6in. × 20in. Hydraulic Plain Cylindrical Grinder.

PRESSES

HUMPHRIS 80 ton open fronted inclinable, adjustable stroke.
New **RATZER** 12 ton Power Press, adj. str.
SWEENEY & BLOCKSIDGE No. 6 Detachable Arm Flypress.

MISCELLANEOUS

QUALTERS & SMITH 6in. Hacksaw.
RHODES 6ft. 6in. × ¼in. Heavy Duty Universal Swing Beam Folder.
OSTER Screwing Machine, 2in. gas max.
RICHARDS Horizontal Borer, non-travelling spindle, 32in. facing head, with extension to face about 5ft. dia.

There are many more at

STRAIGHT & VINES LTD.,
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LONDON, S.E.1
Telephone: HOP 4364

DIMCO

No. 3 GISHOLT Bar Feed Capstan Lathe with equipment.
No. 2 WARNER & SWASEY Capstan Lathe. Chucking.
2D HERBERT Bar Feed Capstan.
No. 3 GISHOLT Chucking Capstan.
43in. × 12in. FITZ WERNER Vertical Miller. Swivelling head.
U3 VICTORIA Universal Milling Machine with Vertical and Slotting attachments. 8 years old.
20in. ARCHDALE Plain Miller. Power feeds and rapids. Spindle speeds 60-1,230 r.p.m.
20in. ARCHDALE Plain Miller. Power feeds and rapids. Spindle speeds 30-615 r.p.m.
No. 3 KITCHEN & WADE Honer.
No. 2 KITCHEN & WADE Honer.
11in./16in. NOBLE & LUND Hydraulic Cold saw with Hydraulic clamp.
Model HBY CHURCHILL Electrical Grinder.
14in. BUTLER Slotter. Power revolving table.
8in. FABIUS S.S. & S.C. Lathe. 5ft. between centres. As new.
No. 3 RICHARDS Horizontal Borer Model PRT3.
No. 3 KEARNS Horizontal Borer.
No. 2 KEARNS Horizontal Borer.
8in. REED PRENTICE Lathe 6ft. 6in. between centres.
16in. CRAVEN Lathe 20ft. between centres.
54in. × 15in. CRAVEN Universal Milling Machine.
HERBERT S.E. Capstan Lathe.
24in. ORCUTT Automatic Gear Grinder (New).
4A LIBBY Turret Lathe.
CRAVEN Worm Milling Machine.

DIMCO (Gt. Britain) LTD.
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SHEpherds Bush 4401/2.

NEW MACHINE TOOLS FROM STOCK

GRANOR OF HALIFAX 28in. stroke Heavy Duty Shaping Machine. 400-440/3/50.

EARLY DELIVERY

MITCHELL OF KEIGHLEY 8¼in. Type DMS Gap Bed Lathe, by 5ft. 3in. B.C. 400-440/3/50. Instant delivery.
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CENTAUR TOOL WORKS,
EYRE STREET, SPRING HILL,
BIRMINGHAM, 18
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Cam or Profile Copy Milling Machines for diameters up to 20in. or areas up to 18in. × 22in. Also Rotary End Profile Miller. All 400/3/50.—HICKS MACHINERY, LTD., 26, Addison Place, London, W.11. Tel.: PARK 2333.

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HAVE AVAILABLE FOR EARLY DELIVERY

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Capacity: 18in. by 12in. Table 14in. Spindle Nose to top of table.

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All ex rebuilt stock.

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OF HIGH WYCOMBE

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CHALLENGER S & S.C., 5in. Centre Lathe. £80
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SMART & BROWN 4in. Centre Lathe. £110
SOUTHBEND S.S. & S.C. 4½in. Centre Lathe. £120

DRILLING MACHINES

ADCOCK & SHIPLEY Pillar Drill, No. 2 Morse. £65
SMITH & COVENTRY Pillar Drill, No. 2 Morse. £40
HERBERT ½in. cap. High Speed Bench Drill. £35

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EXCEL No. 1 Bench Surface Grinding Machine. £85
JONES & SHIPMAN Universal Cylindrical Grinder, Model 1027. £750

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BEAVER Model A Turret Mill, 28in. × 6in. table. (As New.) £335
CINCINNATI No. 3 Sliding Head Vertical Dial Selection, 63in. × 15in. table. £750
CINCINNATI No. 3 Sliding Head Vertical, 55in. × 13½in. table. £350
DENBIGH C4 Universal Mill, 46in. × 10in. table, 2/1 vertical head. £395
MILWAUKEE No. 2 Horizontal, 50in. × 14in. table. £475
PARKSON 2P Horizontal, 52in. × 12in. table. £550

PRESSES

Fly Press No. 3 **NORTON**. £27
Fly Press No. 4 **VIZOR**. £27 10s.
Double Column Fly Press, screw dia. 2½in. £70
Bench Arbor Press. £12
Double Column Bench Arbor Press. £35

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INVICTA 6M Stroke Shaper. £500
BUTLER Planer, 9ft. × 2½ft. table. £1,100
EHRENFELD Planing Machine, 13ft. × 3½ft. table. £1,400

THIS LIST DOES NOT INCLUDE THE MANY NEW MACHINES THAT ARE AT PRESENT IN OUR SHOWROOM AT HIGH WYCOMBE. WHY NOT VISIT US TO INSPECT OUR RANGE?

A. DOUGLAS CO., LTD.,
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HERBERT 1¼in. Pedestal Drill.
CORONA 4ft. Radial Drill. £325.

GRINDERS

JONES & SHIPMAN 10in. × 27in. Universal Grinder.
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SMART & BROWN Internal Grinder. 1¼in. Max.
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LATHES

SOUTHBEND 6¼in. Lathe T/T.
JOHNSTEAD 5ft. 6in. Facing Lathe.
MURAD 4in. 3Q Capstan, full equip.
DARLING & SELLERS 10¼in. × 12ft. T/T.
HASSE & WREDE 10in. × 42in.
OLDFIELD & SCHOFIELD 15in. × 60in. £650.
HERBERT SMALLPIECE, 6in. × 24in. Multi-tool.
RIVET Instrument Lathe, 4½in. × 24in.

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A KERSHAW Vert. Mill 18in. × 7in.
RICHMOND 0.1 Horizontal 30in. × 8in.
CENTEC No. 3R Auto-cycle, pro mill.
HEY Duplex Spline Mill. £175.
ADCOCK & SHIPLEY IVM Vert. 25in × 7in. As new.

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BLISS 250 ton Coining Press.
BLISS 21B 60 ton geared. Adj. Str.
BLISS 20B 20 ton Roll feed. Adj. Str
RHODES 30 ton geared, adj. str.
BESCO 20 ton.
WARD 20 ton.
TAYLOR & CHALLEN 10 ton.
SEDGWICK 12ft. × ⅛in. Folder.
BESCO 10 ton Power Press. £175.
E.M.G. 9-ton Airdraulic. £200.

MISCELLANEOUS

BOTNIA 5ft. × 18in. Planer.
RAPIDOR 8in. × 8in. heavy duty power saw.
MANURHIN TR12-16 ¼in. Auto. 1958.
T.T. & H. Engraver CB with div. table.
MIDSAW 36in. Bandsaw.
BARBER & COLMAN 15in. Hobber.
THIEL Filing and Sawing Machine. £95.
HURTH Key Seating Machine. £225.
THIEL Punch Shaper.
ORMEROD 12in. Shaper with Cam Cutting Attach.
RAPIDOR 15in. × 15in. Filing and Sawing. £165.

Other machines in stock.

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EXCHANGES WELCOME | **HIRE PURCHASE ARRANGED**

Lang 20in. Surfacing and Boring Lathe, Chuck Model. Excellent Machine.
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Asquith type H.D.P. two-spindle Profile Milling M/c. Adjustable cross-rail. Ind. motor drive to each spindle. Capacity 24in. × 26in. Spindle speeds 250-3,000 r.p.m.—LEE & HUNT LTD., Crocus Street, Nottingham. 'Phone 84246.

Newman

AUTOMATICS

BULLARD Multi-Au-Matic 7in. 8 spindle.
BULLARD Multi-Au-Matic 12in. 6 spindle.

BORING MACHINES

KEARNS Model OB Horizontal Boring and Facing Machine, 2¾in. diameter travelling spindle (1957).
UNION Model BFT100 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle (1955).
KEARNS Model OC Horizontal Boring Machine, 3in. dia. travelling spindle.
KEARNS No. 4 Horizontal Boring and Facing Machine, 4in. diameter travelling spindle.
WEBSTER & BENNETT Vertical Boring Machine, table 50in. diameter.
RICHARDS Type PRT Horizontal Floor Boring Machine, 3½in. travelling spindle, 28in. diameter facing head.

CAPSTAN AND CENTRE LATHES

CHURCHILL-REDMAN Model 13NM Heavy-Duty S.S. & S.C. Gap Bed Centre Lathe, 13in. centre height × 72in. between centres. Swing in gap 50in.
MITCHELL Model DM10 S.S. & S.C. Gap Bed Centre Lathe, 10¼in. centre height × 7ft. 5in. between centres. (NEW.)
OLDFIELD & SCHOFIELD Surfacing and Boring Lathe, 10¼in. centre height.
WARD 7B Combination Turret Lathe.
NILES Heavy Duty Centre Lathe, S.S. & S.C., 17in. centre height × 28ft. between centres.
U.L.R.O. Heavy Duty Centre Lathe, 16in. centre height × 30ft. between centres.

DRILLING MACHINES

HETTNER Radial Drilling Machine, 10ft. elevating arm.

GEAR MACHINES

ORCUTT Model HM24 Hydraulic Internal Gear Grinder.
GLEASON 3in. Straight Bevel Gear Generator.

GRINDING MACHINES

CRAVEN Roll Grinding Machine, capacity 20in. swing × 138in. between centres.
CHURCHILL Model HBY Internal Grinding Machine.
CHURCHILL Plain Cylindrical Grinding Machine, 26in. swing × 84in. between centres (1951).
LANDIS Type C Plain Hydraulic Cylindrical Grinding Machine, 6in. swing × 18in. between centres.
ORCUTT Model HM24 Internal Spur Gear Grinding Machines.
CHURCHILL Plain Hydraulic Cylindrical Grinding Machine, 20in. swing × 72in. between centres.
BROWN & SHARPE Plain Cylindrical Grinding Machine, 10in. swing × 36in. between centres.

MILLING MACHINES

CINCINNATI Model 5/72 Plain Hydromatic Milling Machine, table 91in. × 22in. (1952).
CINCINNATI No. 2L Plain Horizontal Milling Machine, table 52in. × 10in.
CINCINNATI No. 1M Vertical Milling Machine.
CINCINNATI No. 4 Dial Type Horizontal Milling Machine.
PRATT & WHITNEY Model BL3620 3-spindle "Keller" Die Sinking Machine.
CENTEC Model 3R Automatic Production Milling Machine, table 25in. × 16in.

MISCELLANEOUS

LANGE & GAILEN 28in. stroke Double Headed Hydraulic Shaping Machine.
TAYLOR & CHALLEN Double Sided 50-ton Geared Power Press, 10in. stroke.

NEWMAN INDUSTRIES LIMITED
Machine Tool Division: YATE, BRISTOL
Tel.: Chipping Sodbury 3311. Telex. 44121.
Cables: "Dynamo Yate."
London Office: Terminal House, Grosvenor Gardens, S.W.1. Tel.: Sloane 8206.
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RING BELLS for machine tools

LEEDS 63-7398

BESCO No. 21 Power Press. 40 tons capacity. Inclinable, ungeared, open fronted. Fixed stroke 3in. Bed 27½in. by 18in. Bed to guides 12½in. M.D. 400/3/50.

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PRECIMAX Hydraulic Vertical Spindle Surface Grinder. Segmental wheel 18in. dia. Grinding cap. 16in. by 48in. M.D. 400/3/50.

NORTON 48in. by 12in. Horizontal Hydraulic Surface Grinder. Admits 17in. under wheel. Grinding wheel size 12in. by 2in. max. Hydraulic table and cross feed to head. With 12in. by 48in. chuck and 400/3/50 electrics.

NORTON Type C 10in. by 48in. Hydraulic Plain Grinder. Admits 20in. wheel. Filmatic bearings. M.D. 400/3/50.

PACERA Pillar Drill. Model MF.2. Sensitive. Cap. ¼in. 5 speeds by V-cone pulley. Centre of spindle to column 7½in. M.D. 400/3/50.

AVEY 2 spindle Sensitive Drill. No. 2 M.T. M.D. 220-440/3/50.

POLLARD Type 15HF High Speed Horizontal Drill. Cap. ⅞in. Swing over bed 15in. dia. Admits 12in. between chuck and loose head. M.D. 400/3/50.

CINCINNATI 4/36 Duplex Hydromatic Miller. Table 54in. by 16in. Speeds 20–150 r.p.m. M.D. 400/3/50.

CENTEC No. 3 Production Miller. Table 22in. by 6in. Variable hydraulic feeds. M.D. 400/3/50.

FRITZ WERNER Model 8101 Manufacturing Miller. Table 36in. by 12in. Long. traverse 20in. 16 speeds 45–2,240 r.p.m. by change gears with fully automatic cycle. M.D. 415/3/50.

HILMOR Type C.2 Hand Operated Pipe Bender. Heavy Duty Non-Mandrel Type. Cap. in steel 1in.–3in. outside dia. by 14's gauge. With 22 formers and 16 guides.

TAYLOR & CHALLEN 10 ton Horning Press. Model No. 793. 3in. stroke; 1¼in. adjustment to slide; fixed horn. Electrics 400/3/50.

MILWAUKEE 2HL Vertical Miller. Table 46in. by 9in. Speeds 35–1,400 r.p.m. Quick power traverse 3 ways to table.

NEW MANCHESTER Rapidor Light and Medium Duty Hacksaws. Cap. 6in. by 6in. M.D. 400/3/50.

NEW UNION Model G.14 Double Ended Grinder. Wheel 14in. by 2in. M.D. 400/3/50.

NEW UNION Model G.15 Double Ended Grinder. Wheels 12in. by 1½in. M.D. 400/3/50.

NEW PROGRESS Model 3A Pillar Drill. Spindle No. 3 M.T. Cap. 1½in. T-slotted table 22in. by 18in. Spindle to column 10in. 5 speeds 110–1,780 r.p.m. M.D. 400/3/50.

H. BELL (Machine Tools) LTD., Walter Street, LEEDS 4.

Le Blond Rapid Production

Lathe, all-geared, 400/3/50, compound slide and rear toolpost, equipment, also Regal 19in. × 48in. S.S. & S.C. Lathe. Ex. Cond.—C. L. THOMAS, LTD., Stirling Road, Solihull. Tel.: 3075-6.

Siemens Schuckert Electrically

Heated Furnace, 6ft. 10in. dia., 8ft. 10in. deep, 550 deg. C., 100 kW, 400 volts.

New Process 100 kV Seam Welder, 400/3/50.

British Federal 50 kVA Flash Butt Welding Machine, 400/3/50.

Fielding 50 ton hydraulic horizontal pipe bender, up to 6in. bore hydraulic tubes.

200 Ton Fielding Downstroke Hydraulic Press, 14in ram, 42in. stroke, 63in. daylight.

100 Ton Fielding ditto, 10in. ram, 72in. stroke, 99in. daylight.

50 Ton Fielding ditto, 3ft. stroke.

Bliss 70 Ton Geared Double Sided Power Press. 400/3/50 supply.

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Bennie Punching, Shearing and Section Cropping Machine, 4½in. × 4½in × ½in. angle.

Windsor 6-oz. Plastic Injection Moulding Machine.

Sedgewick Bending and Folding Machine, 6ft. × ½in., motorised.

8ft. × ½in. Bennie Bending Rolls.

7ft. × 1in. Craig Donald Flattening Rolls.

"Pyramid" Bending Rolls, 9ft. 0in. × ⅛in.

200 Tons Tangye Hydraulic Straightening Press, bed 25ft. × 5ft., stroke 21in., motorised travelling table, 2 ram pump.

Hugh Smith Double Table Scarfing Machine, 13in. fixed stroke, from 16in. to 8ft. wide, 1½in. thick steel plates.

Crow, Harvey Punch, Shears and Angle Cropper, 18in. blade, 27in. throat, heavy duty.

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Robertson Shears, ½in. capacity, 10 h.p. 28in. blade, 9in. maximum opening. (Two.)

Berry Plate Guillotine, capacity 4ft. × 1in. 18in. throat, 30 h.p. motor.

New 1-cwt. and 2-cwt. Hammers by Massey and Alldays & Onions, also 3-5-cwt. secondhand E.O.T. Cranes.

30 Ton Marshall Fleming, 29ft. span, cab control.

25 Ton Clyde, 21ft. 9in. span, cab control 1954. Can convert any span to 95ft.

20 Ton Vaughan 42ft. 3in. span. Unused.

20 Ton Morris Goliath, 35ft. span, 5 ton auxiliary.

10 Ton Heywood, 34ft. span. Unused.

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10 Ton, 60ft. span. 1955. (Two.)

5 Ton, 37ft. span. 1944.

3 Ton Morris, 149ft. span. 1954.

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PRECIMAX Cylindrical Plain Grinder. Capacity 8in. × 24in. Plunge feed. Coolant tank and fittings. 400/3/50.

ARCHDALE 28in. All Purpose Horizontal Milling Machine. Table size 38in. × 13in. Power and Rapid Power traverse all ways. Spindle speeds 30 to 462 r.p.m. 400/3/50.

RASKIN Type 6A 100 ton Geared, Eccentric Power Press. Adjustable Stroke ½in. to 3½in. Bed area 29½in. × 23½in. 400/3/50.

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TAYLOR & CHALLEN 4½ G.D.P. Power Press. Punch Stroke 15in. Maximum draw 7½in. Largest blank 18in. dia. Distance between uprights 24in. Complete with Operator's Guards. 400/3/50.

TAYLOR & CHALLEN 3½ G.D.P. Power Press. Punch Stroke 10in. Maximum draw 5in. Largest blank 14in. dia. Distance between uprights 22in. 400/3/50.

SWEENEY & BLOCKSIDGE No. 9 Geared, Inclinable, Power Press. Pressure 20 tons. Adjustable stroke 1in. to 4in. Motorised 400/3/50. Operator's Guards.

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VAN NORMAN No. 12 Sliding Head, Milling Machine. Table size 38in. × 8in. 9 spindle speeds 70 to 1,465 r.p.m. 12 auto feeds ⅛in. to 14in. per minute. 400/3/50. Complete with Vertical Attachment.

RUSHWORTH Geared, Overcrank, Power Guillotine. Capacity 10ft. × ½in. m.s. 20 strokes per minute. Motorised 15 h.p., 400/3/50. Complete with automatic hold-down, front and rear guards, fully guarded and spare set of blades.

BROOKES Overcrank, Double Geared, Power Guillotine, capacity 4ft. × ½in. Powered Work table (in two sections) 24ft. long approx. × 4ft. wide. 20 h.p., 400/3/50.

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BERRY 9½in. by 48in. Gap Bed.	£875.
SIMMONDS 12in. by 66in. Gap Bed.	£450.
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HERBERT 2SS Chucker.	£325.
HERBERT 4 Chucker.	£130.
HERBERT 9 Comb. Turret.	£350.
HERBERT 9 Comb. Turret. Rebuilt.	£850.
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NERO ½in. Collet Capstan.	£175.
PITTLER R.B. 36 Capstan.	£250.
ACME 4 Spindle Bar Auto.	£450.
P. & G. 5D Chuck Auto.	£425.
HERBERT 3 Chuck Auto.	£250.

MILLING MACHINES

MILWAUKEE 2K Universal.	£1,250.
DENBIGH 4C Universal.	£325.
RICHMOND O.1 Universal.	£250.
ARCHDALE 28in. Production.	£350.
CINCINNATI 1-12 Production.	£550.
P. & W. Slab Mill Prod.	£155.
CINCINNATI No. 2 Vert.	£1,450.
HERBERT 15S Vert.	£525.
HERBERT 18V Vert.	£595.
ASQUITH Profile Mill.	£450.

GRINDING MACHINES

J. & S. Tool and Cutter.	£425.
WICKMAN Auto Cutter.	£275.
HUNT No. 2 Drill.	£225.
HUNT No. 4 Drill.	£235.
ARTER 12in. Ring.	£495.
B. & S. No. 13 Universal.	£575.
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LANDIS 10in. by 30in. Uni.	£750.
NOVAMATIC Type B Internal	£650.

DRILLING MACHINES

K. & W. 4ft. Heavy Radial.	£625.
CINCINNATI 4 Morse.	£65.
BAUGH Radial Tapper.	£150.

THE CAUSEWAY, EGHAM
SURREY
EGHAM 4166-7

MACHINES NOW IN STOCK

BORING MACHINES

MATHEYS Model FPN/28 Semi Jig Borer.

PADDON MK3 type WP Cylinder Re-boring Machines.

CAPSTANS AND TURRET LATHES

BOLEY-LEINEN Model ER15 ¼in. Capstan (modern).

HERBERT No. 2 Pre-optive Bar Turret Lathe, Flamard bed, 2in. capacity with bar feed, full turret tooling.

HERBERT Model 22A Turret Lathe. 8½in. S.P. Hole.

LIBBY 2H 8in. spindle Turret Lathe.

CENTRE LATHES

SOUTHBEND 7in. Centre Lathe.

CRAVEN Heavy Duty Railway Wheel Lathe, swing 6ft. × 12ft. vee belt drive. Weight 25 tons.

GRINDING MACHINES

VICO (Swiss) Hydraulic Toolroom Universal Grinder 10in. by 30in.

LAMBERT Model 73 Watchmaker's Cutter Grinders (two).

CRAVEN Heavy Duty Roll Grinding Machine with capacity for rolls 42in. dia. by 12ft. between centres and fitted with automatic cambering. Will take rolls up to 25 tons weight. Fully motorised machine of modern design. WEIGHT 25 tons.

WALDRICH SIEGEN Roll Grinder. 36in. by 13ft. between centres.

Two **CINCINNATI** No. 2 Tool and Cutter Grinding Machines.

COVEL No. 2 Tool and Cutter Grinding Machine.

IMPERIA Tool and Cutter Grinder, Model M6 AR.

MATRIX No. 16G Plain Straight Thread Grinder.

MATRIX No. 6 Internal Thread Grinders, 3in. by 10in.

HEALD Model 81 Sizematic Internal Grinder.

WOLTERS Model I.L.1 Hydraulic Internal Lapping Machine.

PETEWE Model 3D Profile Grinding Machine. (Nearly new.)

DIESINKING MACHINES

VICTORIA Duplomatic Hydraulic Copy Milling Machine, 8in. by 8in. (NEW).

DRILLING MACHINES

PACERA ½in. Bench Drill (New).

Two **ARCHDALE** 36in. Radial Drilling Machines. No. 4 M.T.

CRAFTSMAN ½in. Bench Drills; four at £25 each.

Various **ACIERA** Precision Bench Drills.

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BESCO 42in. by 10 s.w.g. Power Guillotine.

HANDS 4ft. by ¼in. Guillotine.

RHODES 6ft. by ¼in. Guillotine.

MILLING MACHINES

EDGWICK No. 1 Horizontal Milling Machine 40in. by 10in. table.

DENBIGH Model No. C4 Horizontal Milling Machines.

SANT ANDREA Model U.F.O/5 Extra heavy duty Horizontal Miller. 86½in. by 19in. Table travel 67in.

VICTORIA Junior Omnimil (New).

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WILSON 7½in. × 36in. S.S. & S.C. Lathe.
CINCINNATI 3/36 Hydromatic Millers (3).
ARCHDALE 30in. Vertical Miller.
STAMCO 5ft. × ¼in. Deep Throat Guillotine.

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We will rebuild your own machine tools back to makers' specification with 6 months' guarantee.

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CARDIFF 11in. × 80in. S.S. & S.C. Lathe.
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ASQUITH 6ft. Radial Drill with screw cutting attachment.

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PITTLER TYPE RGII 82.
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HERBERT 4B and 4.
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NATCO 24 spindle No. 1 M.T.
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HERBERT 2 spindle.
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ARCHDALE 3ft. Radial No. 3 M.T.
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HERBERT "C" Power Feed.
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LELAND GIFFORD 2-sp., No. 2 M.T.
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LIENHARD 3-dimensional. (New.)
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T.T. & H. Type C, and M.A.
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RAPIDOR Filing.
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MAXICUT 7in. × 2in. × 6 D.P.
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BRYANT 16/38 and 5.
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JONES & SHIPMAN, 10in. × 27in. T. & C.
J. & S. Drill, ¼in. to ¾in.
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HONER
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including Cincinnati 3/24 PLAIN HYDRO-MATIC MILLING MACHINE; Kitchen & Wade motorised VERTICAL CYLINDRICAL HONING MACHINE; Thompson HYDRAULIC BROACH GRINDER; SURFACE, CYLINDRICAL, ROTARY and other GRINDERS; S.S. & S.C. LATHES; PLAIN, UNIVERSAL and VERTICAL MILLING MACHINES; VERTICAL DRILLING MACHINE; POWER PRESSES; 210 Petrol Electric CHARGING SETS; 30 Russell-Newbury 62.5 kVA. DIESEL ELECTRIC GENERATING SETS; Petrol Electric Generating Sets; 8 Coventry Climax FORK LIFT TRUCKS; M.T. Spares; "Matbro-Mantis" Diesel Driven HEAVY DUTY HYDRAULIC EXCAVATOR; Aveling Barford Petrol ROAD ROLLER; CONCRETE MIXERS; 3 Barber, Greene TAR MACADAM PLANT DRYERS; 4,000 pairs BINOCULARS; 1,700 POCKET WATCHES; 500 WRISTLET and STOP WATCHES; 2,000 PRISMATIC COMPASSES; 400 SIGNALLING TELESCOPES; ELECTRIC CABLE; Electrical Stores; Scrap Radar and Wireless Equipment. RECEPTION SETS; COMMUNICATION RECEIVERS, 160 cases WIRELESS KIT EQUIPMENT; Portable Batteries; THEODOLITES, SURVEYORS' LEVELS; 3,000 Ammeters, Voltmeters and Wavemeters; Tool Kits; Small Tools, Service Clothing; Furniture and numerous other effects.

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REDMAN 10ft. × 4ft. × 3ft. Planer, Lancs. drive.
RICHARDS No. 1, 2 and 4 Horiz. Borers.
DENHAM 11in. × 6ft. 6in. S.S. & S.C. Lathe.

W. FORREST & CO. LTD.,
SYLVESTER GARDENS,
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If you do not wish your reply to any Box No. advertisement in this section to be forwarded to certain firms, please advise us. Your reply will then be destroyed, but you will not be notified as this would disclose the identity of the advertiser.

Automatics Expert Required for sale and service of Continental precision machine tools from London. Experience with tooling design and layout for Swiss-type autos essential. Must have personality to advise clients. Interesting, well-paid post for someone who likes mixture of inside and outside work.—BOX C957, MACHINERY, Clifton House, Euston Road, N.W.1.

Engineer with Managerial Ex- perience of small Companies to assist in rapidly growing Company in S. Devon. Toolmakers, Presswork and Specialised Products. Opportunity for keen Engineer with good training. Tool design experience an advantage.—Full details in confidence to MANAGING DIRECTOR, BOX D124, MACHINERY, Clifton House, Euston Road, N.W.1.

Auto Shop Manager, Single- and multi-spindles. Old-established firm enlarging Auto Shop require first-class Manager. Must be fully competent all aspects. Excellent salary, output bonus and prospects. Present staff have been advised of this advertisement.—Full details to MANAGING DIRECTOR, BOX D135, MACHINERY, Clifton House, Euston Road, N.W.1

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2. SENIOR AND JUNIOR JIG AND TOOL DRAUGHTSMEN for design and detailing of fixtures and Multi-Spindle Drill Heads.

Housing will be available in Hatfield for selected applicants.

Apply:
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A long established Company employing over 1,000 people requires staff for an expanding Development Department. The work is related to the large scale manufacture and filling of tin boxes, and plastic containers.

SENIOR DESIGN DRAUGHTSMAN capable of producing schemes for new machines.

DRAUGHTSMEN to design and detail from schemes.

ENGINEERS capable of developing prototype machines to the standard required for use in a production line.

AN ENGINEER to assist in the development of processes and machinery for quantity productions of small plastic components.
This man would have the opportunity to study the latest techniques and machinery, and would also have experimental equipment, so that he could advise on plant and tooling.

FITTER/MACHINIST to work directly with the engineers and designers making and modifying components for development testing.

A recognised apprenticeship would be considered an asset to all applicants, and academic qualifications according to the position are desirable. However, experience and enthusiasm are the most important considerations in selecting the right people.

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FOR "CLASSIFIED" ADVERTISEMENT RATES PLEASE SEE PAGE 125. SERIES RATES ON REQUEST.

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Wickman 1¾in.-2¾in. Multi 5 spindle bar auto, with tooling. Good condition. Particulars and price.—BOX D147, MACHINERY, Clifton House, Euston Road, N.W.1.

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INDEX TO ADVERTISERS

(Continued on page 156)

INDEX TO ADVERTISERS—*(continued from page 155)*

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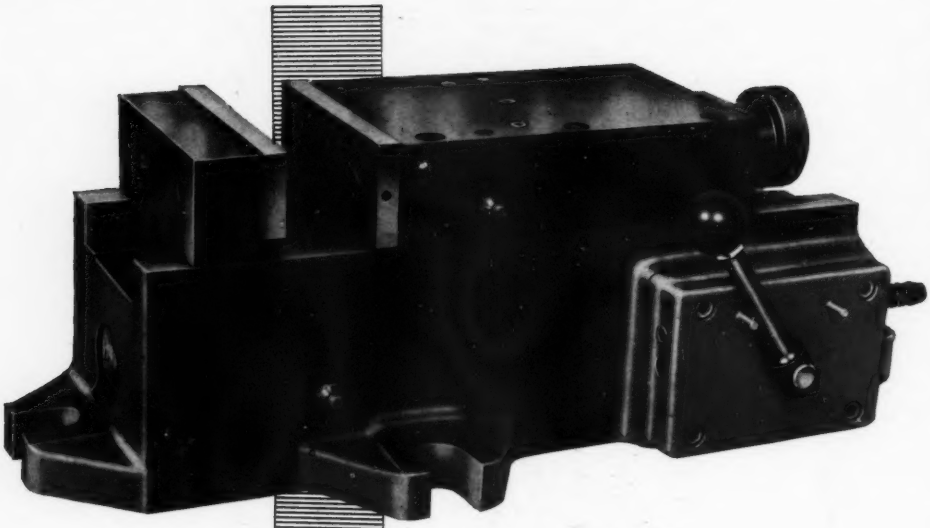

The PRATT

PNEUMATIC MACHINE VICE

PRINCIPAL DIMENSIONS

Width of Jaw	4½″	6″
Depth of Jaw	1⅜″	1⅝″
Maximum Opening	2½″	4½″
Minimum Opening	0″	1⅜″
Power Movement	⅛″	⅛″
Gripping Force at 80 P.S.I.	4,800 lbs	7,700 lbs
Length Overall	15½″	19½″
Width Overall	7½″	9½″
Height Overall	5½″	6½″
Weight (approx.)	54 lbs	126 lbs

RAPID OPERATION

HIGH GRIPPING POWER

NO OPERATOR FATIGUE

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FOR INCREASED PRODUCTION

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